# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	:	9 400 610 221	1/4
ZEXEL No.	:	101695-3202	
Date	:	31.10.1992	[3]
Company	:	KOMATSU	
Engine	:	S6D95L / 6207-7	1-1451

IP-Type number : 101069-9430 / PES6A Governor type number : 105400-8040 / EP/RSV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar: 1.6

Test nozzle holder combination: 1 688 901 013

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 2.00 x 6.00 x 600

PORT CLOSING

Prestroke mm :  $3.6 \pm 0.05$ 

Rod position mm: -

Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)

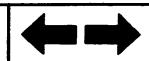


# Injection Quantity:

Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm³/1000 str.)	Difference (%)	Fixed	Remarks
A	12.2	750	62.7 ± 1.0	± 2.5	Rack	Basic
	approx.10.0	400	12.5 ± 1.0	± 15.0	Rack	
А	12.2	750	62.7 ± 1.0	<del>-</del>	Lever	Basic
		,				

# Timing Advance Specification:

Pump Speed (rpm)			
Advance Angle (deg)			



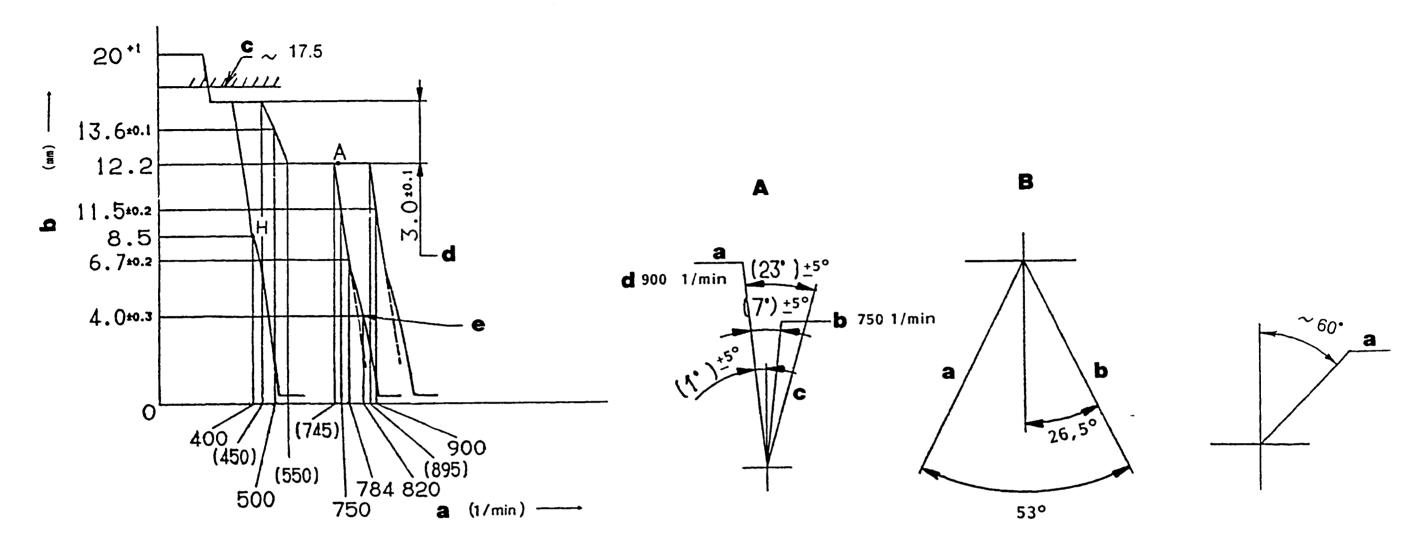


Figure 75

Pump speed

Control rack position

Control rack limit:

d = Difference in control rack position between 750 rpm and 400 rpm

e = Idle-sub spring setting:

GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 12

A = Speed Control Lever Angle

a = Full-speed b = Setting:

c = Idling

d = Setting:

(on our shipment)

B = STOP LEVER ANGLE

a = Stop

# TIMING SETTING

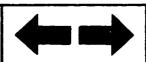
At No. 1 plunger's beginning of injection position.

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a = Key position

b = Normal

**ZEXEL** - Test values Injection pumps



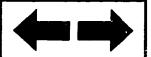
A5 Injection pumps

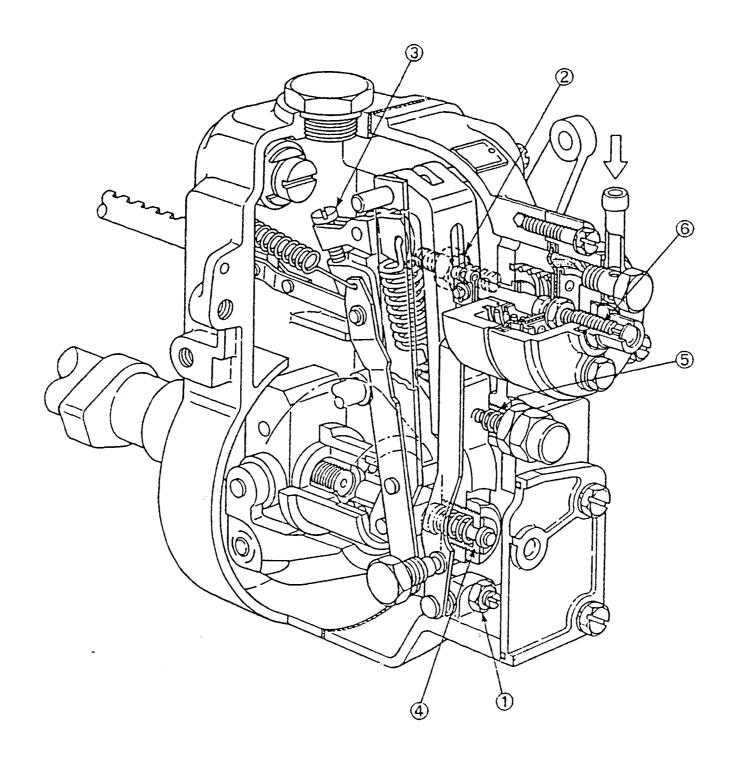
- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

## ADJUSTMENT

<u></u>	<del></del>		Pump Speed	Rack Position	Boost pressure	Remarks
			(rpm)	(mm)	kPa (mmHg)	
Full-load Adjus	tment		1100	12.2	-	Adjust using screw (2)
(Temporary)			600	12.2		Adjust using screw (1)
Torque Control	1.st str	oke	approx. 350	15.2	-	Adjust using spring capsule (4)
Spring Adjust-			500	13.6		• Confirm
ment			approx. 500	12.2		• Confirm the torque control stroke
						is: 3.0 ± 0.1 mm
	2.st str	oke	-	-	-	Adjust using spring capsule (4)
	ł					• Confirm
						• Confirm the torque control stroke
						is: (mm)
Maximum-speed Ad	djustment		750	12.2	_	Fix the control lever
_			784	6.7		Confirm speed droop -
						adjust using screw (3)
			900	10.5 ± 0.2		• Confirm
Boost Compensato	or System		_	-		Fix the control lever
_						Adjust using screw (6)
						Confirm the boost compensator
	•					stroke is: (mm)
Idling Adjustmer	nt	T	820	4.0 ± 0.3	-	Fix the control lever
1. Idling Sub Sp	oring					Adjust using spring capsule (5)
						• Confirm
2. Control Lever	r	Н	400	8.5	-	Adjust using the control lever
Full-load Adjust	tment	*	750	12.2	-	Adjust using screw (1)
Control Lever Angle			• Measure the c	control lever angl	e at the "idlin	g" and "full" positions.
Measurement			• When the cont	rol lever is depr	ressed toward th	e "full" position, replace the
			shifter's shi	im with a thicker	one.	
			• When the cont	rol lever is depr	ressed toward th	e "idling" position, replace the
			shifter's, sh:	im with a thinner	one.	
Control Rack Lin	niter	·	0	approx. 17.5	-	Adjust using screw
Adjustment						

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Figure 76

1 = Screw

2 = Screw

3 = Screw

4 = Spring capsule

5 = Spring capsule

6 = Screw

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# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	: 9 400 610 222 1/4
ZEXEL No.	: 101695-3580
Date	: 31.10.1992 [0]
Company	: KOMATSU
Engine	: 6D95L / 6206-71-1460

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 1 688 901 013

Opening pressure bar : 175

Test pressure line

Inner x Outer Dia - Length mm : 2.00 x 6.00 x 600

PORT CLOSING

Prestroke mm :  $3.6 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)



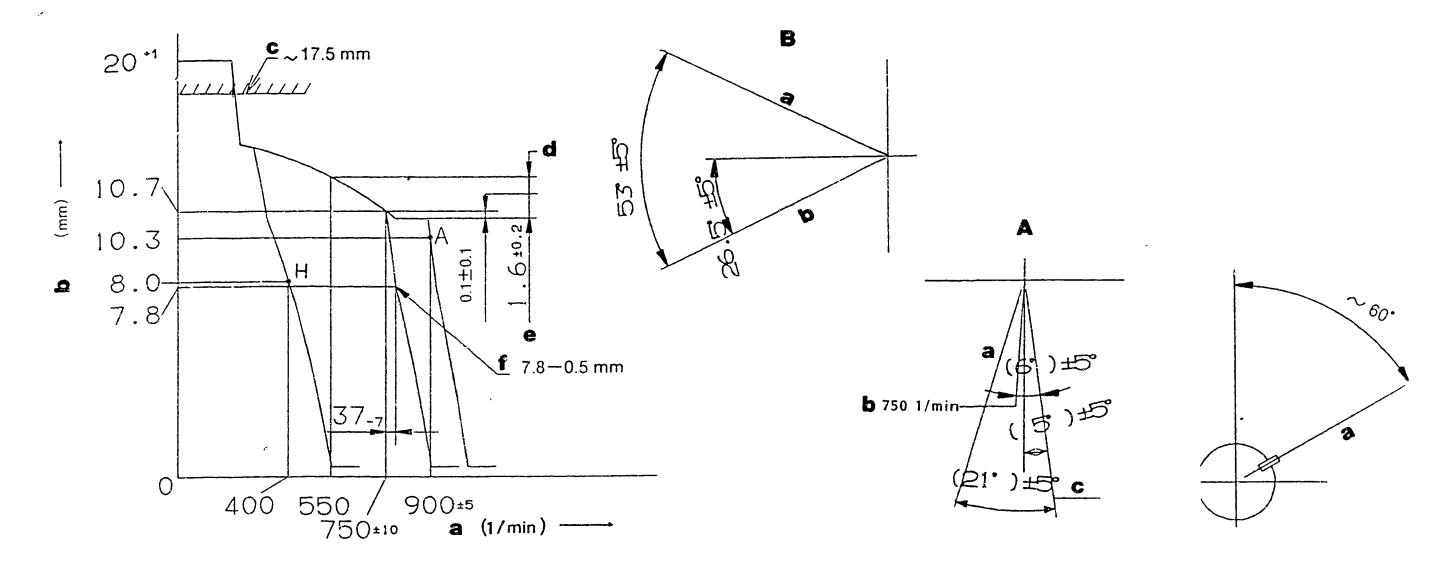
# Injection Quantity:

Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm <sup>3</sup> /1000 str.)	Difference (%)	Fixed	Remarks
А	10.3	900	52.0 ± 1.0	± 2.5	Rack	Basic
	approx. 9.1	400	10.5 ± 1.0	± 15.0	Rack	
А	10.3	900	52.0 ± 1.0	-	Lever	Basic

## Timing Advance Specification:

Pump Speed			
(rpm)			
Advance			
Angle (deg)	 		i i

A12



a = Pump speed

= Control rack position

c = Control rack limit:

d = Difference in control rack position between 800 rpm and 550 rpm

e = Difference in control rack position between 800 rpm and 750 rpm

f = Idle-sub spring setting:

GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 8

A = Speed Control Lever Angle

a = Idling

b = Setting:

c = Full-speed

B = STOP LEVER ANGLE

a = Stop b = Normal TIMING SETTING

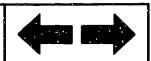
At No. 1 plunger's beginning of injection position.

a = Camshaft key groove position

**ZEXEL - Test values** 

Injection pumps

A13



**A14** 

**ZEXEL** - Test values

Injection pumps



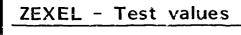
101695-3580 2/4

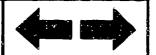
## Note

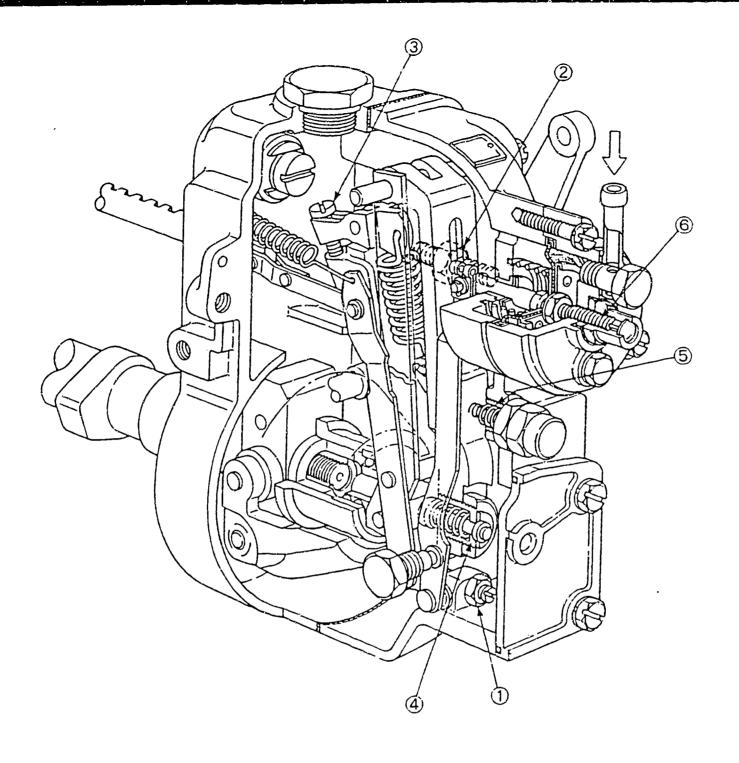
- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

## **ADJUSTMENT**

			Pump Speed	Rack Position	Boost pressure	Remarks
			(rpm)	(mm)	kPa (mmHg)	
Full-load Adjus	Full-load Adjustment		1100	10.3	-	Adjust using screw (2)
(Temporary)			600	10.6		Adjust using screw (1)
Torque Control Spring Adjust- ment			550 750 ± 10	12.2 10.7	_	<ul> <li>Adjust using spring capsule (4)</li> <li>Confirm</li> <li>Confirm the torque control stroke is: (mm)</li> </ul>
	2.st str	ke	-	-		<ul> <li>Adjust using spring capsule (4)</li> <li>Confirm</li> <li>Confirm the torque control stroke is: (mm)</li> </ul>
Maximum-speed Adjustment			750 ± 10 750+37 +30	10.7	_	<ul> <li>Fix the control lever</li> <li>Confirm speed droop -         adjust using screw (3)</li> <li>Confirm</li> </ul>
Boost Compensator System			-	-	-	<ul> <li>Fix the control lever</li> <li>Adjust using screw (6)</li> <li>Confirm the boost compensator stroke is: (mm)</li> </ul>
Idling Adjustme 1. Idling Sub S			750+37 +30	7.8 -0.5	-	<ul><li>Fix the control lever</li><li>Adjust using spring capsule (5)</li><li>Confirm</li></ul>
2. Control Leve	r	Н	400	8.0	-	Adjust using the control lever
Full-load Adjustment			850	10.6	_	• Confirm
Control Lever A Measurement	ngle		<ul><li>When the cont shifter's shi</li><li>When the cont</li></ul>	rol lever is depr m with a thicker	ressed toward th one. ressed toward th	ng" and "full" positions.  The "full" position, replace the  The "idling" position, replace the
Control Rack Li Adjustment	miter		0	approx. 17.5	-	Adjust using screw







1 = Screw

2 = Screw

3 = Screw

4 = Spring capsule

5 = Spring capsule

6 = Screw

ZEXEL - Test values

Injection pumps

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# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	: 9 400 610 223 1/4
ZEXEL No.	: 103662-2292
Date	: 31.10.1992 [6]
Company	: KOMATSU
Engine	: SA6D170A / 6162-73-1332

IP-Type number : 103066-3760 / PE6ZW Governor type number : 105445-0521 / EP/RSUV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 0 681 343 002

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 4.00 x 8.00 x 1500

PORT CLOSING

Prestroke mm :  $3.8 \pm 0.05$ 

Rod position mm : - Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)

# Injection Quantity:

Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm <sup>3</sup> /1000 str.)	Difference (%)	Fixed	Remarks
A	18.4	875	584 ± 5	± 4.0	Rack	Basic
Н	approx. 7.8	400	75.7 ± 5	± 14.0	Rack	
A	18.4	875	584 ± 5	<del>-</del>	Lever	Basic
		· · · · · · · · · · · · · · · · · · ·	ė			
		<del>, _, , _ = .</del> .				

## Timing Advance Specification:

Pump Speed (rpm)	•		
Advance			
Angle (deg)			

**A20** 

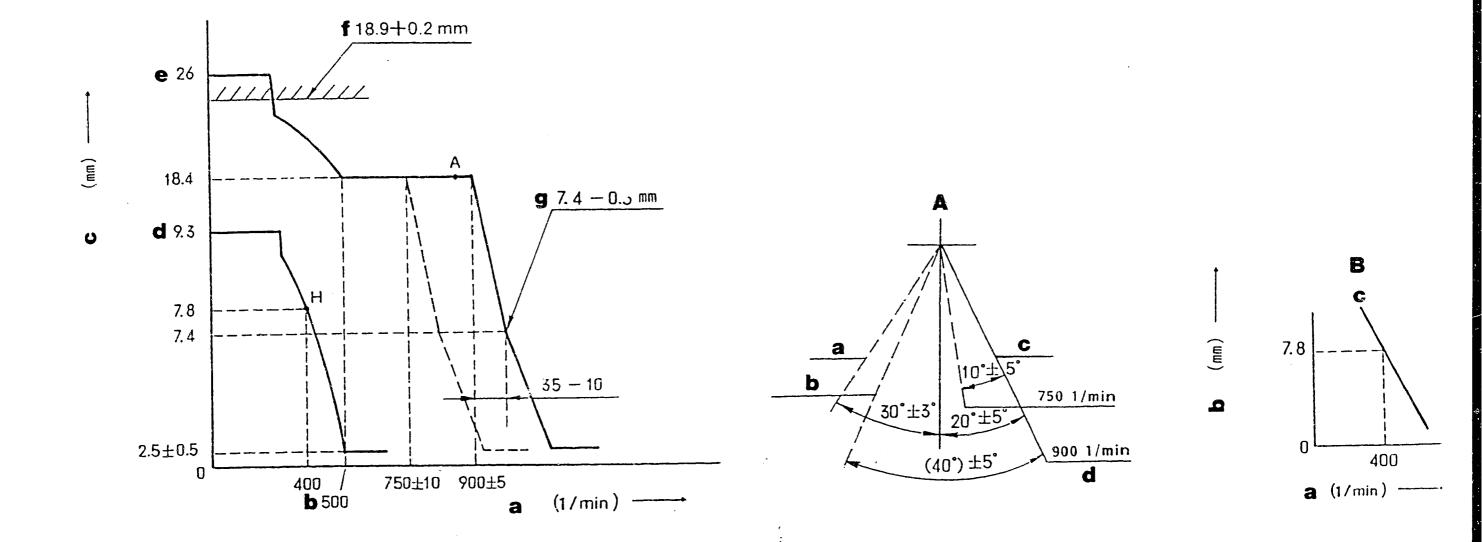


Figure 79

## Minimum-Maximum Speed Specification

a = Pump speed

b = Above

c = Control rack position

d = Above

e = Above

f = Control rack limit:

g = Idle-sub spring setting:

### GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 10

## A = Speed Control Lever Angle

a = Stop

b = Idling
c = Full-speed

d = (On our shipment)

# B = Variable Speed Specification

103662-2292 2/4

a = Pump speed

b = Control rack position

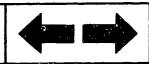
c = Idle setting

ZEXEL - Test values
Injection pumps



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ZEXEL - Test values



## Note

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

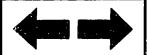
## ADJUSTMENT

			Pump Speed	Rack Position	Boost pressure	Remarks
			(rpm)	(mm)	kPa (mmHg)	
Full-load Adjus	Full-load Adjustment			18.4	-	Adjust using screw (2)
(Temporary)			600	18.4		Adjust using screw (1)
Torque Control 1.st stroke Spring Adjust- ment		oke	above 500	18.4	-	<ul> <li>Adjust using spring capsule (4)</li> <li>Confirm</li> <li>Confirm the torque control stroke is: (mm)</li> </ul>
	2.st stro	oke	<u>-</u>	-	_	<ul> <li>Adjust using spring capsule (4)</li> <li>Confirm</li> <li>Confirm the torque control stroke is: (mm)</li> </ul>
Maximum-speed Adjustment			900 ± 5 900+35 +25	18.4 7.4	-	<ul> <li>Fix the control lever</li> <li>Confirm speed droop - adjust using screw (3)</li> <li>Confirm</li> </ul>
Boost Compensator System			_	-	_	<ul> <li>Fix the control lever</li> <li>Adjust using screw (6)</li> <li>Confirm the boost compensator stroke is: (mm)</li> </ul>
Idling Adjustme 1. Idling Sub S			900 ± 5 900+35 +25	7.4	-	<ul><li>Fix the control lever</li><li>Adjust using spring capsule (5)</li><li>Confirm</li></ul>
2. Control Leve	2. Control Lever H		0 400 above 500	above 9.3 7.8 2.5 ± 0.5	_	<ul><li>Adjust using the control lever</li><li>Confirm</li></ul>
Full-load Adjustment			875	18.4	-	• Confirm
Control Lever Angle Measurement			<ul><li>When the cont shifter's shi</li><li>When the cont</li></ul>	rol lever is depr m with a thicker	ressed toward th one. ressed toward th	I g" and "full" positions. e "full" position, replace the e "idling" position, replace the
Control Rack Li Adjustment	miter		0	18.9 + 0.2	-	Adjust using screw



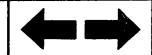
ZEXEL - Test values

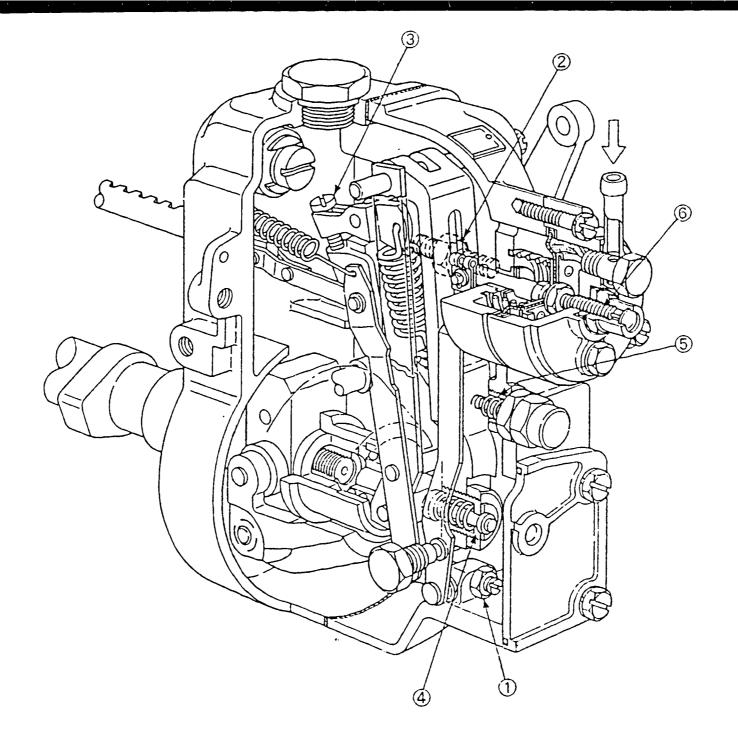
Injection pumps



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ZEXEL - Test values





1 = Screw

2 = Screw

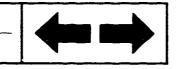
3 = Screw

4 = Spring capsule

5 = Spring capsule

6 = Screw

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ZEXEL - Test values



# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	: 9 400 610 224 1/4
ZEXEL No.	: 103662-3051
Date	: 31.10.1992 [6]
Company	: KOMATSU
Engine	: SA6D170A / 6162-73-1334

IP-Type number : 103066-3900 / PE6ZW Governor type number : 105445-0791 / EP/RSUV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 0 681 343 002

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 4.00 x 8.00 x 1500

PORT CLOSING

Prestroke mm :  $3.8 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark of Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)



# Injection Quantity :

Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm <sup>3</sup> /1000 str.)	Difference (%)	Fixed	Remarks
A	18.4	875	584.0 ± 5.0	± 4.0	Lever	Basic
Н	approx. 7.8	400	75.7 ± 5.0	± 14.0	Rack	
A	18.4	875	584.0 ± 5.0	-	Lever	Basic

## Timing Advance Specification:

Pump Speed			
(rpm)			
Advance			
Angle (deg)			

**B3** 

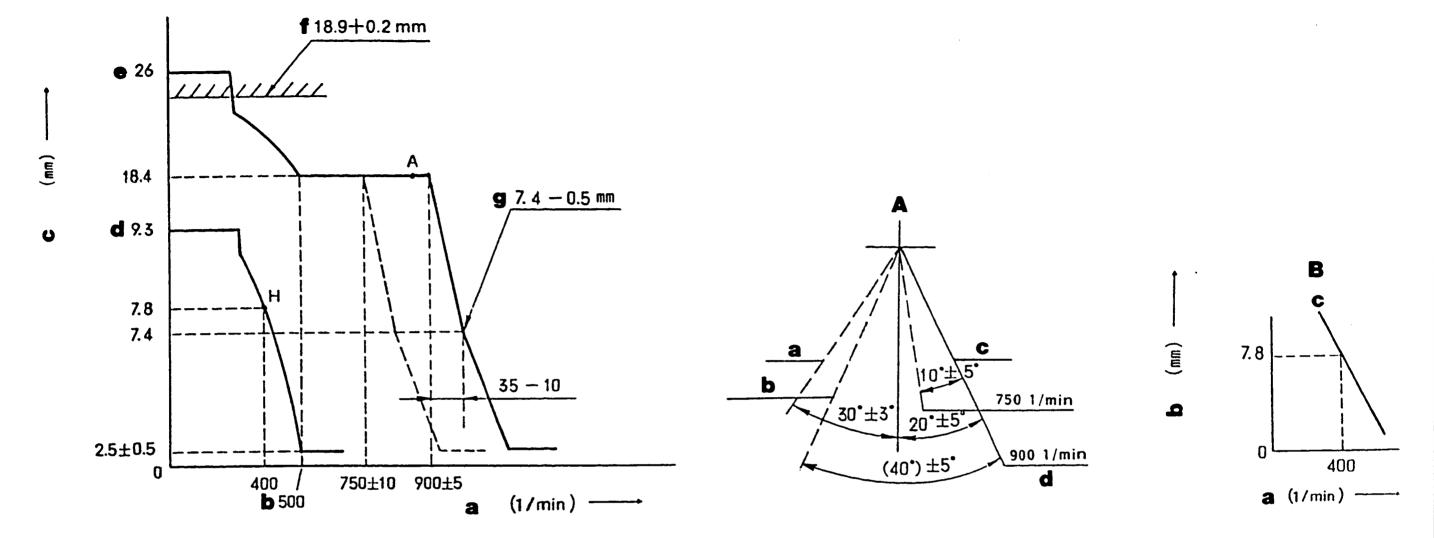


Figure 81

## Minimum-Maximum Speed Specification

a = Pump speed

b = Above

c = Control rack position

d = Above

e = Above

**B4** 

f = Control rack limit:

g = Idle-sub spring setting:

GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 10

A = Speed Control Lever Angle

a = Stop

b = Idling

c = Full-speed

d = (on our shipment)

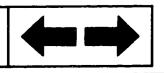
B = Variable Speed Specification

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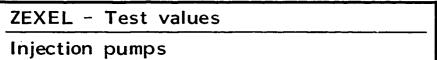
a = Pump speed

b = Control rack position

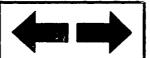
c = Idle setting

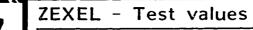


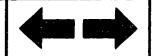
			Pump Speed (rpm)	Rack Position (mm)	Boost pressure kPa (mmHg)	Remarks
Full-load Adjus	tment		1100	18.4	-	Adjust using screw (2)
(Temporary)			600	18.4		Adjust using screw (1)
Torque Control 1.st stroke Spring Adjust- ment		above 500	18.4	-	<ul> <li>Adjust using spring capsule (4)</li> <li>Confirm</li> <li>Confirm the torque control stroke is: (mm)</li> </ul>	
	2.st stro	ke	-	-	-	<ul> <li>Adjust using spring capsule (4)</li> <li>Confirm</li> <li>Confirm the torque control stroke is: (mm)</li> </ul>
Maximum-speed A	djustment		900 ± 5 900+35 +25	18.4 7.4	-	<ul> <li>Fix the control lever</li> <li>Confirm speed droop -         adjust using screw (3)</li> <li>Confirm</li> </ul>
Boost Compensator System			_	-	_	<ul> <li>Fix the control lever</li> <li>Adjust using screw (6)</li> <li>Confirm the boost compensator stroke is: (mm)</li> </ul>
Idling Adjustment 1. Idling Sub Spring			9C0+35 +25	7.4	-	<ul><li>Fix the control lever</li><li>Adjust using spring capsule (5)</li><li>Confirm</li></ul>
2. Control Leve	r	Н	0 400 above 500	above 9.3 7.8 2.5 ± 0.5	-	<ul><li>Adjust using the control lever</li><li>Confirm</li></ul>
Full-load Adjustment		875	18.4	-	• Confirm	
Control Lever Angle  Measurement  Measure the control lever angle at the "idling" and "formula to the "full" shifter's shim with a thicker one.  When the control lever is depressed toward the "idling shifter's shim with a thinner one.			e "full" position, replace the			
Control Rack Li Adjustment	miter		0	18.9 + 0.2	-	Adjust using screw

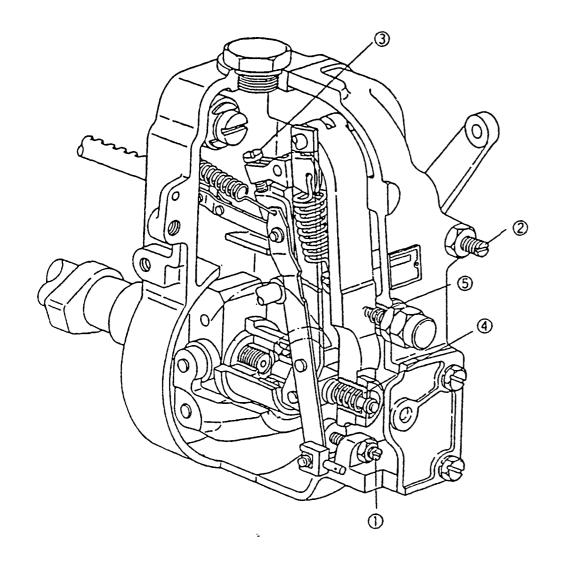


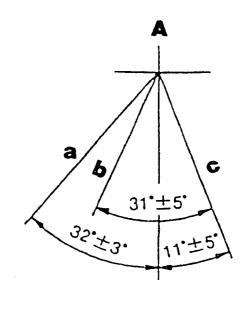
**B6** 











1 = Screw

2 = Screw

3 = Screw

4 = Spring capsule

5 = Spring capsule

#### Note

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

B9 ZEXEL - Test values

Injection pumps

A = CONTROL LEVER ANGLE

a = Stop

b = Idling

c = Full-speed



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Test oil ZEXEL - TEST VALUES 1/2 ISO 4113 or Distributor pumps BOSCH No. 9 460 610 336 SAE J967d Engine model: TD27 ZEXEL No. 104740-7680 Date: 31.10.1992 [2] NISSAN DIESEL Company: 16700 43G19 Injection pump no.: 104640-9562 (NP-VE4/10F2150RNP558) No. Pump rot.: Clockwise-viewed from drive side Test-nozzle holder combination: Test pressure line: 1 688 901 000 1 680 750 017 P. Speed Setting values Charge-air pressure Difference in 1. Setting values (rpm) kPa (mmHq) delivery (cm³) 1-1 Timing device travel 1700 4.7 - 5.1 (mm) 1-2 Supply pump pressure 1700 549-608 (5.6-6.2) kPa (kgf/cm<sup>2</sup>) 1-3 Full load delivery  $49.8 - 50.8 \text{ (cm}^3/1000\text{st)}$ 1100 3.0 Full load delivery  $(cm^3/1000st)$ 1-4 | Idle speed regulation 350  $5.3 - 9.3 \text{ (cm}^3/1000\text{st)}$ 2.0  $45.0 - 80.0 \text{ (cm}^3/1000\text{st)}$ 1-5 Start 100 1-6 Full-load speed regulation 2350  $32.2 - 36.2 \text{ (cm}^3/1000\text{st)}$ 1-7 Load-timer adjustment 2. Test values 2-1 Timing device 1700 2150 2550 N = rpm1100 2.0-3.2 4.6-5.2 6.0-7.2 6.8-7.8 mm 2-2 Supply pump 1700 2150 N = rpm3. Dimensions 549-608 647-706 kPa (5.6-6.2) $(kqf/cm^2)$ (6.6-7.2)2-3 Overflow delivery N = rpm1100 3.2 - 3.4 mmK  $cm^3/10s$ 43.0-87.0 KF 5.7 - 5.9 mm 2-4 Fuel injection quantities MS 0.8 - 1.0 mm P. Speed Charge-air pres | Difference in Fuel delivery Speed control lever pos. BCS mm kPa (mmHq) delivery (cm<sup>3</sup>) (rpm)  $(cm^3/1000st)$ Pre-st. End stop 1100 49.3 - 51.3 Control lever angle 600 48.8 - 52.8 51.5°- 59.5°deq 2150 38.7 - 42.9 Ya 26.3 - 28.7 mm 2350 31.7 - 36.7 31°- 41° deg 5.6 - 14.6 2550 В 9.3 - 12.9 mm 2700 below 5.0 deg mm Switch off 350 0 5.3 -350 9.3 Idlestop 450 below 3.0 Cut-in voltage max.:8V 2-5 Test voltage: 12 - 14V Solenoid

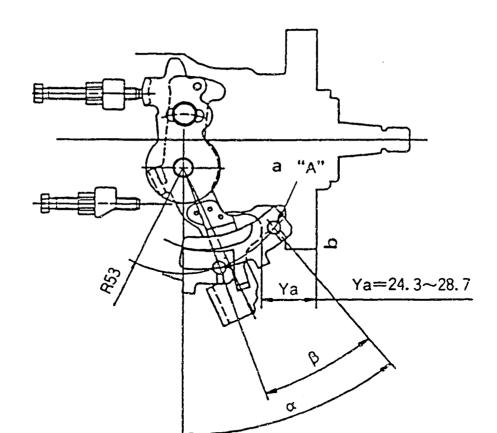
**ZEXEL** - Test values Injection pumps



**B11** 

ZEXEL - Test values





\$

104740-7680 2/2

a = Hole
b = Flange

- Control Lever Angle Measurement Position
  - 1. Measure the control lever angles  $(\alpha,\ \beta,\ \gamma)$  at hole "A".

ZEXEL - Test values



Test oil: ISO 4113 or SAE J967d

Distributors pumps Engine model: 4D56-T

9 460 610 523 BOSCH No. ZEXEL No. 104740-8182 Date: 31.10.1992 [0] Company: MITSUBISHI No. MD167348

Injection pump no.: 104640-8182

(NP-VE4/10F2100RNP952)

		• •		
Pump rot.: Clockwise-viewed from drive side	Test-nozzl	e holder combination:	Test pressure line:	
	1 688 901	022	1 680 750 073	
1. Setting values	P. Speed	Setting values	Charge air pressure	Difference in
_	(rpm)		kPa (mmHg)	delivery (cm³)
1-1 Timing device travel	1000	3.5 - 3.9 (mm)	72.0-74.6 (540-560)	
1-2 Supply pump pressure	1000	382-441 (3.9-4.5) kPa (kgf/cm <sup>2</sup> )	72.0-74.6 (540-560)	
1-3 Full load delivery	2000 (FULL)	64.6 - 65.6 (cm <sup>3</sup> 1000st)	72.0-74.6 (540-560)	5.0
Full load delivery	750 (BCS)	63.4 - 64.4 (cm <sup>3</sup> 1000st)	42.7-45.3 (320-340)	
1-4 Idle speed regulation	375	14.9 - 17.9 (cm <sup>3</sup> 1000st)	э	2.5
1-5 Start	100	67.0 - 87.0 (cm <sup>3</sup> 1000st)	0	·
1-6 Full-load speed regulation	2650	24.9 - 30.9 (cm <sup>3</sup> 1000st)	72.0.74.6 (540-560)	5.5
1-7 Load timer adjustment	1000	T-0.5-0.9 (mm)	72.0.74.6 (540-560)	
		<u></u>		<u> </u>

### 2. Test values

	C.air pres	72.0-74.6 (540-560) mmHg					
2-1 Timing device .	N = rpm	500	1000	1250	1500	2000	2100
	mm	0.7-2.3	3.4-4.0	4.1-5.3	5.1-6.3	7.2-8-4	7.3-8.2
2-2 Supply pump	N = rpm		1000		1500		2100
	kPa		382-441		500-559		637-696
	(kgf/cm²)		(3.9-4.5)		(5.1-5.7)		(6.5-7.1)
2-3 Overflow delivery	N = rpm		1000				
	cm³/10s		48.0-92.0				-

12-4	Fuel	injection	quantities
			<b>4</b>

Control lever position	P. Speed	Fuel delivery	Charge-air pressure	Difference in
	· (rpm)	(cm <sup>3</sup> /1000st)	kPa(mmHg)	delivery(cm <sup>3</sup> )
End stop	2000 (FULL)	64.1 - 66.1	72.0-74.6 (540-560)	
	750 (BCS)	62.9 - 64.9	42.7-45.3 (320-340)	
	600	46.0 - 51.0	0	
	1250	68.2 - 73.2	72.0-74.6 (540-560)	ļ
	2100	62.5 - 65.5	72.0-74.6 (540-560)	
	2650	24.4 - 31.4	72.0-74.6 (540-560)	
	<b>*1</b> 2950	below 5.0	72.0-74.6 (540-560)	
Switch off	375	0	0	<del> </del>
Idle	750	below 3.0	0	
stop	375	14.4 - 18.4	0	
Partial load	<b>*2</b> 900	7.5 - 19.5	0	
2-5	Cut-in volt	age max.: 8V		<del></del>
Solenoid	Test voltag	ge: 12 - 14V		

3. D:	ımens	ion	3	
K KF	3.2 - 5.7 -			
MS	0.6 -	0.8	mm	
BCS	-		mm	
Full st.	-		mm	
Contro.	l lever	angle	9	
α	55°-	63°	deg	
A	8.3 -			
β	37°-	470	deg	
В	11.7 -	15.3	mm	
γ C	-		deg	
С			mm	

**ZEXEL** - Test values

Injection pumps



**ZEXEL** - Test values



### 1. Adjustment

1) Fix the control lever in the position satisfying the following conditions:

Boost Pressure: 72.0 - 75.0 kPa (640-660) mmHg

Pump Speed : 1000 rpm

Fuel Injection: 49.5 - 51.0 cm<sup>3</sup>/1000st

Quantity

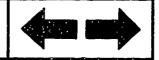
- 2) With the control lever positioned as described in 1) above, adjust the governor sleeve so that the Timer Stroke conforms to the specified values (Item 1-7).
- 2. Confirmation of Timer Characteristics

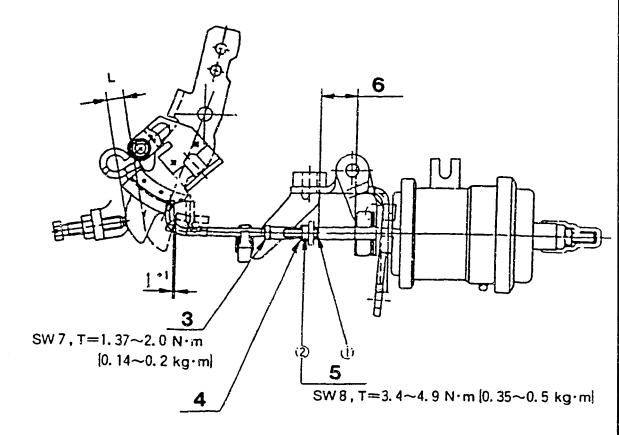
Fix the control lever in the position satisfying the following conditions, and confirm the Timer Stroke.

Contro	l lever position	Specifie	d values	
Pump speed (rpm)	Fuel injection quantity (cm³/1000st)	Boost press. kPa(mmHg)	Timer stroke (mm)	Timer stroke reduction value (mm)
1000	49.0 - 51.0	72.0-75.0 (540-560)	-	0.4 - 1.0
1000	38.5 - 41.5	72.0-75.0 (540-560)	~	1.2 - 2.4

#### Note:

- For items \*, confirmation is as follows:
  - 1. Insert the shims (1 mm thick) between the control lever and the full-speed stopper bolt.
  - 2. Confirm the fuel injection quantity at the specified pump speed.
- Insert an 8.9 mm partial characteristics shim (for V-actuator adjustment) and measure the fuel injection quantity (for items marked \*2).





104740-8182 3/4

3 = Rod position adjusting nut

4 = Rod position adjusting nut

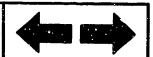
5 = Stroke adjusting nut

6 = Actuator stroke

## 2-STAGE ACTUATOR ADJUSTMENT SPECIFICATIONS

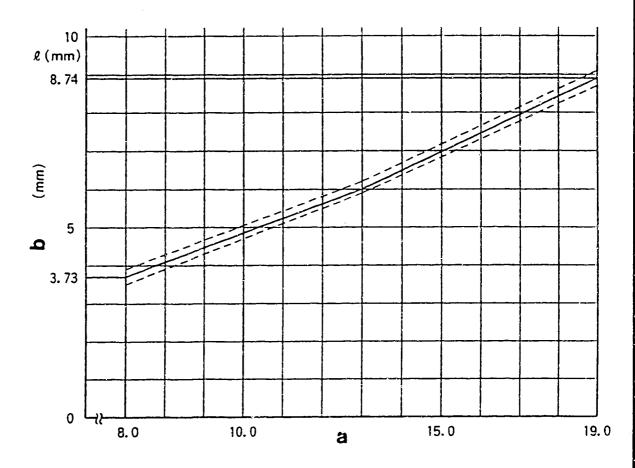
## Actuator Adjustment

- 1. Attach the actuator to the injection pump.
- 2. Move the control lever to the idle position.



#### (Continued)

- 3. Adjust the rod position adjusting nut so that the clearance between the control lever and rod is  $1^{+1}$  mm.
- 4. Insert a shim of thickness L mm (determind from the partial injection quantities graph) between the control lever and the idle stopper.
- 5. Adjust the screw (1) so that a full actuator stroke is obtained at the above control lever angle. Then, fix the screw using the nut (2).



104740-8182 4/4

a = Fuel injection quantity (cm<sup>3</sup>/1000st)

b = Shim thickness

Graph of actuator stroke adjusting shim thickness for partial fuel injection quantities.

At NP = 900 rpm, insert an 8.9 mm shim between the control lever and the idle stopper and measure the fuel injection quantity.

## Actuator stroke adjustment points (for reference)

Injection quanti	ty specification	Actuator stroke set position			
Pump speed (rpm)	Injection quantity (cm <sup>3</sup> /1000st)	Control lever angle	Shim thickness $\hat{l}$ (mm)	Actuator stroke (mm)	
900	7.7 ± 1	(9.5°)		approx. 9.6	

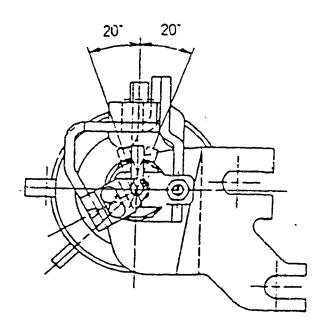


Figure 86

2-stage actuator adjustment specifications

Rod installation position tolerance ± 20°

**B20** 





Distributor pumps

Engine model: 4D56

BOSCH No. 9 460 610 537 ZEXEL No. 104740-8431 31.10.1992 [2] Date: MITSUBISHI Company: MD183698

Injection pump no.: 104640-8431 (NP-VE4/10F2000RNP1049) No. Pump rot.: Clockwise-viewed from drive side Test-nozzle holder combination: Test pressure line: 1 688 901 000 1 680 750 017

1. Setting values		P. Speed	Setting values	Charge-air pressure	Difference in
		(rpm)		kPa (mmHg)	delivery (cm³)
1-1 Timing	device travel	1250	4.3 - 4.7 (mm)		
1-2 Supply	pump pressure	1250	451-490(4.6-5.0) kPa (kgf/cm <sup>2</sup> )		
1-3 Full lo	oad delivery	1250	43.3 - 44.3 (cm <sup>3</sup> /1000st)		3.0
Full lo	oad delivery		- (cm <sup>3</sup> /1000st)		
1-4 Idle sp	eed regulation	375	8.5 - 11.5 (cm <sup>3</sup> /1000st)	i	2.0
1-5 Start		100	63.0 - 83.0 (cm <sup>3</sup> /1000st)		
1-6 Full-lo	ad speed regulation	2150	15.1 - 21.1 (cm <sup>3</sup> /1000st)	İ	4.0
1-7 Load-ti	mer adjustment	1250	T-C.8-1.2 (mm)		
1-8	_			ļ	

#### 2. Test values

2-1 Timing device	$\bar{N} = rpm$	500	750	1250	1750	2000
F)	mm	1.4-2.6	2.2-3.4	4.2-4.8	6.0-7.2	7.1-8.0
2-2 Supply pump	N = rpm			1250		2000
	kPa			451-490		618-677
	(kgf/cm²)			(4.6-5.0)		(6.3-6.9)
2-3 Overflow delivery	N = rpm			1250		
	cm³/10s			48.0-92.0		

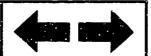
2-4 Fuel injection quantities

mp speed (rpm)	Fuel delivery	Charge-air press.	Difference
(rpm)			1 principline
, - <u>F</u> ,	$(cm^3/1000st)$	kPa (mmHg)	(cm³)
1250	42.8 - 44.8		
600	40.3 - 44.3		
1750	36.2 - 40.2		
2000	35.1 - 39.3		
2150	14.6 - 21.6		
2500	above 5.0		
375	0	·	
750	below 3.0		
600	below 5.0		
375	8.0 - 12.0		
-in volta	ge max. 8 V		
t voltage	: 12 - 14 V		
	1250 600 1750 2000 2150 2500 375 750 600 375 -in voltage	1250	1250

3. Dimensions					
K KF MS BCS	3.2 - 5.7 - 1.1 -	5.9	mm		
Prestr.	-		mm		
1 Control	llever	angle	2		
Concro.					
α		63°			
α A	55°- 10.9 -	63° 16.0	deg mm		
α	55°- 10.9 -	63°	deg mm		
α A	55°- 10.9 -	63° 16.0	deg mm deg		
α Α β Β	55°- 10.9 - 40°-	63° 16.0	deg mm deg		
α A β	55°- 10.9 - 40°-	63° 16.0	deg mm deg mm		

ZEXEL - Test values

Injection pumps



**ZEXEL** - Test values

**B23** Injection pumps



**B22** 

- 1. Adjustment
  - 1) Fix the control lever in the position satisfying the following conditions:

Boost Pressure: -

kPa (mmHg)

Pump Speed : 1250

rpm

Fuel Injection

Quantity :  $35.2 - 36.2 \text{ cm}^3/1000\text{st}$ 

2) With the control lever positioned as described in 1) above, adjust the governor sleeve so that the Timer Stroke conforms to the specified values (item 1-7).

Contro	l lever position	Specifie	d values	
Pump speed (rpm)	Fuel injection quantity (cm3/1000st)	Boost pressure kPa (mmHg)	Timer stroke (mm)	Timer stroke reduction value (mm)
1250	34.7 - 36.7	-	_	0.7 - 1.3
1250	26.7 - 29.7	-	-	1.8 - 2.4

### ZEXEL - TEST VALUES

Distributor pumps

Engine model: TD27

1/3 9 460 610 538 BOSCH No. ZEXEL No. 104740-9573 31.10.1992 [1] Date: Company: NISSAN DIESEL No. 16700 43G20

(NP-VE4/10F2150RNP559) Injection pump no.: 104640-9572 Pump rot.: Clockwise-viewed from drive side Test-nozzle holder combination: Test pressure line: 1 688 901 000 1 680 750 017

1. S	1. Setting values		Setting values	Charge-air pressure kPa (mmHg)	Difference in delivery (cm <sup>3</sup> )
1-1	Timing device travel	1700	4.7 - 5.1 (mm)		
1-2	Supply pump pressure	1700	549-608(5.6-6.2) kPa (kgf/cm <sup>2</sup> )		
1-3	Full load delivery	1100	49.8 - 50.8 (cm <sup>3</sup> /1000st)		3.0
	Full load delivery		(cm <sup>3</sup> /1000st)		
1-4	Idle speed regulation	350	5.3 - 9.3 (cm <sup>3</sup> /1000st)		2.0
1-5	Start	100	45.0 - 80.0 (cm <sup>3</sup> /1000st)		
1-6	Full-load speed regulation	2350	32.2 - 36.2 (cm <sup>3</sup> /1000st)		
1-7	ACS adjustment	1100	39.7 - 42.7 (cm³/1000st)	-21.9±0.7 (-164±5)	

#### 2. Test values

2-1 Timing device	N = rpm	1100	1700	2150	2550	
	mm	2.2-3.0	4.6-5.1	6.0-7.2	6.8-7.8	
2-2 Supply pump	N = rpm		1700	2150		
	kPa	<b>!</b>	549-608	647-706		
	(kgf/cm²)		(5.6-6.2)	(6.6-7.2)		
2-3 Overflow delivery	N = rpm	1100				
	cm <sup>3</sup> /10s	43.0-87.0				

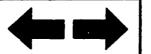
2-4 Fuel injection quantitie	es
------------------------------	----

2-4 Fuel injection quantit:	ies					
Speed control lever pos.	P. Speed	Fuel delivery	Charge-air press	Difference		
	(rpm)	(cm <sup>3</sup> /1000st)	kPa (mmHg)	deliv.(cm³)		
End stop	1100	49.3 - 51.3				
	600	48.8 - 52.8		ļ		
	1100	39.2 - 43.2	-21.9±0.7 (-164±5)			
	2150	38.7 - 42.9				
	2350	31.7 - 36.7				
	2550	5.6 - 14.6				
	2700	below 5.0	İ			
Switch off	350	0				
Idle-	450	below 3.0				
stop	350	5.3 - 9.3	·			
2-5	Cut-in volta	age max.:8V				
Solenoid	Test voltage: 12 - 14V					

3. Dir	mensi	ons		
••		2.4		
K	3.2 -			
KF	5.7 -	5.9	mm	
MS	0.8 -	1.0	mm	
BCS	-		mm	
Pre-st.	-		mm	
Contro	l lever	angle	}	
α	51.5°-	59.59	deg	
Ya	24.3 -	28.7	mm	
β	31°-	41°	deg	
В	9.3 -	12.9	mm	
			deg	
γ C .	i -		5	

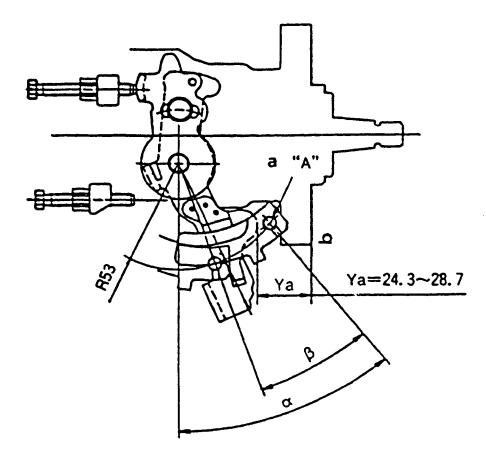
ZEXEL - Test values

Injection pumps



ZEXEL - Test values Injection pumps





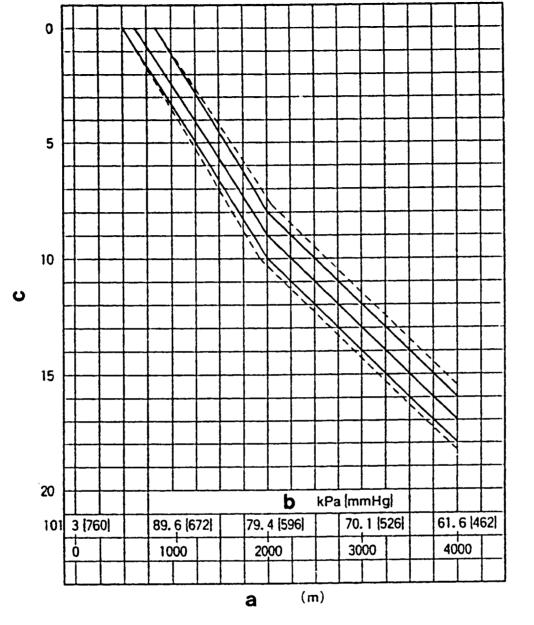
104740-9573 2/3

a = Hole
b = Flange

## CONTROL LEVER ANGLE MEASUREMENT POSITION

1. Measure the control lever angles  $(\alpha,\ \beta,\ \gamma)$  at hole "A".

 $\leftarrow$ 



104740-9573 3/3

a = Altitude

= Atmospheric pressure

c = Injection quantity decrease (cm<sup>3</sup>/1000st)

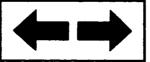
B = Inspection value

FULL-LOAD FUEL INJECTION QUANTITY AND ACS ADJUSTING PROCEDURE AT HIGH ALTITUDES

- 1. FULL-LOAD FUEL INJECTION QUANTITY ADJUSTMENT
  - 1) Remove the ACS cover, the bellows and the adjusting shims.
  - 2) Perform all adjustments as described in the adjusting specifications, except for ACS adjustment.
- 2. ACS ADJUSTMENT
  - 1) Attach the ACS cover, the bellows and the adjusting shims.
  - 2) At a pump speed of 1100 rpm and refering to the graph above, use the shims to adjust the fuel injection quantity decrease according to the altitude.

**ZEXEL** - Test values

Injection pumps



**ZEXEL** - Test values C5 Injection pumps

A = Adjustment value



SAE J967d

#### ZEXEL-TEST VALUES

Distributors pumps

Engine model: D201-02

	1/2
BOSCH No.	9 460 610 526
ZEXEL No.	104741-5322
Date:	31.10.1992 [0]
Company:	ISUZU

8970266733

Injection pump no.: 104641-5322

(NP-VE4/11F1050LNP959)

Pump rotation: Counter clockwise viewed from Test-nozzle holder combination: Test pressure line:

1 688 901 022 drive side

1 680 750 073

No.

Qr.	ive side	1 000 301	1 660 750 075		
1. Setting va	lues	P. Speed (rpm)	Setting values	Charge air pressure kPa (mmHg)	Difference in delivery (cm³)
1-1 Timing device	travel	1100	1.4 - 1.8 (mm)	1	10221027 (0 /
1-2 Supply pump p		1100	500-539(5.1-5.5) kPa (kgf/cm <sup>2</sup> )		
1-3 Full load del	ivery	800	29.2 - 30.2 (cm <sup>3</sup> /1000st)		3.0
Full load del	ivery		(cm³/1000st)		
1-4   Idle speed re	gulation	500	19.7 - 21.7 (cm <sup>3</sup> /1000st)		3.0
1-5 Start		100	above 70.0 (cm³/1000st)		
1-6   Full-load spe	ed regulation	1100	24.0 - 26.0 (cm <sup>3</sup> /1000st)		3.0
1-7 Load-timer ad	ljustment				
1-8					

## 2. Test values

2-1 Timing device	N = rpm	1000		
·	mm	1.3 - 1.9		
2-2 Supply pump	N = rpm			1100
	kPa			500 - 539
	(kgf/cm²)			(5.1 - 5.5)
2-3 Overflow delivery	N = rpm		1050	
	cm³/10s		48.3 - 91.7	

2-4	Fuel	injection	quantities
-----	------	-----------	------------

Control lever position	Pump Speed	Fuel delivery	Charge air pressure			
	(rpm)	(cm <sup>3</sup> /1000 strokes)	kPa (mmHg)			
End stop	800	28.7 - 30.7				
	1050	32.2 - 37.2				
	1100	23.5 - 26.5				
	1200	below 3.0				
·						
•						
Switch off	500	0				
Idle	600	below 3.0				
stop	500	19.7 - 21.7				
2-5	Cut-in volt	Cut-in voltage max. 8 V				
Solenoid Test voltage: 12 - 14 V						

3 D:	m A	5	i	0.11	S

K	2.7	-	2.9	mm	
KF	4.9	-	5.1	mm	
MS	2.0	-	2.2	mm	
BCS		-		mm	
Pre-str.	0.43	-	0.47	mm	
Contro.	lleve	r	angle	3	
α	5°	· –	9°	deg	<u> </u>
A	53.3	-	55.6	mm	
β	12°	· _	22°	deg	
В	3.9	-	7.2	mm	
γ C		-	,9	deg	
lc		-		mm	
1					
			<del>- ,</del> -		

ZEXEL - Test values

Injection pumps

C6



**ZEXEL** - Test values



Adjust the pump with the magnet valve OFF.

Test oil: ZEXEL - TEST VALUES 1/4 ISO 4113 or Distributor pumps BOSCH No. 9 460 610 533 Engine model: CD17 ZEXEL No. 104748-2381 SAE J967d Date: 31.10.1992 [0] NISSAN Company: (NP-VE4/8F2500LNP164) No. Injection pump no.: 104648-2181 16700 16A68 Pump rotation: Counter clockwise viewed from Test-nozzle holder combination: Test pressure line: drive side 1 688 901 000 1 680 750 017 Setting values Difference in P. Speed Charge air pressure 1. Setting values (rpm) kPa (mmHq) delivery (cm3) 1-1 Timing device travel 1.8 - 2.4 (mm) 1200 1-2 Supply pump pressure 1200 304-363(3.1-3.7) kPa (kqf/cm<sup>2</sup>) 1-3 Full load delivery 1200 29.5 - 30.5 (cm<sup>3</sup>/1000st) 2.5 Full load delivery  $(cm^3/1000st)$  $8.3 - 11.3 \text{ (cm}^3/1000\text{st)}$ 1-4 | Idle speed regulation 400 3.0  $45.3 - 55.3 \text{ (cm}^3/1000\text{st)}$ 1-5 Start 100 1-6 Full-load speed regulation 2700 11.9 - 17.9 (cm<sup>3</sup>/1000st)1-7 Load-timer adjustment 1-8 2. Test values 2-1 Timing device N = rpm1200 1800 2500 mm 1.7 - 2.54.0 - 5.26.8 - 8.01200 2-2 Supply pump N = rpm1800 2500 3. Dimensions 294 - 373 kPa 431 - 510 598 - 677 (kgf/cm<sup>2</sup>) (3.0 - 3.8)(4.4 - 5.2)(6.1 - 6.9)2-3 Overflow delivery N = rpm1200 K 3.2 - 3.4 mm  $cm^3/10s$ 36.0 - 80.0 KF 5.7 - 5.9 mm 2-4 Fuel injection quantities MS 1.7 - 1.9 mm Pump Speed Fuel delivery Charge air pressure Control lever position BCS mm (cm<sup>3</sup>/1000 strokes) (rpm) kPa (mmHq) Pre-str. End stop 1200 29.0 - 31.0Control lever angle 600 1°- -1° deg 24.8 - 28.8 2500 26.7 - 30.7 15.4 - 18.1 mm Ya 37° - 47° deg 2700 11.4 - 18.4 2900 below 6.0 10.7 - 14.8 mm 10.5°- 11.5°deg 6.7 - 7.3 mm Switch off 400 0 7.8 - 11.8 Idle 400 below 3.0 stop 600 700 13.3 - 20.0 Partial load 2-5 Cut-in voltage max. 8 V Solenoid Test voltage: 12 - 14 V





C10 |-

Injection pumps



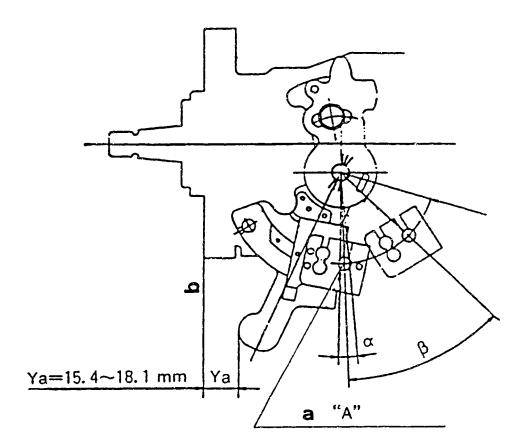


Figure 89

104748-2381 2/4

a = Hole
b = Flange

## CONTROL LEVER ANGLE MEASUREMENT POSITION

1. Measure the control lever angles  $(\alpha,~\beta,~\gamma)$  at hole "A".

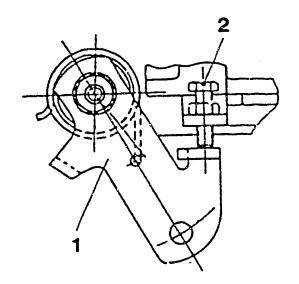


Figure 90

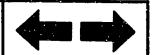
104748-2381 2/4 (continued)

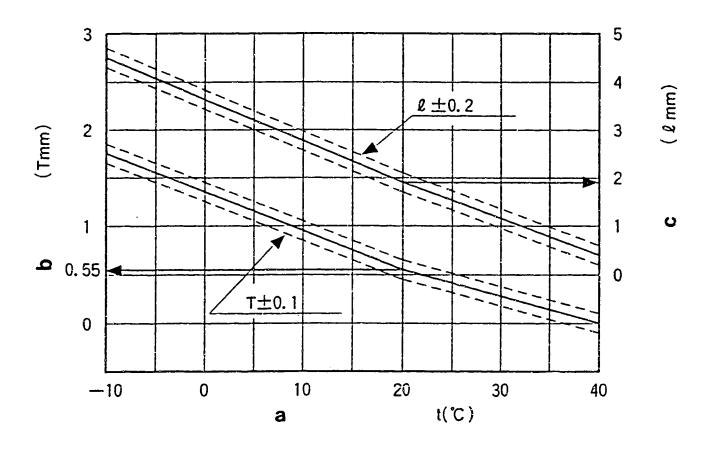
1 = Stop lever

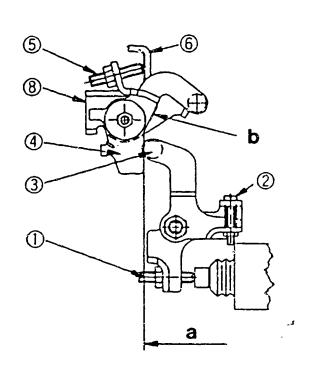
2 = Adjusting bolt

STARTING INJECTION QUANTITY ADJUSTMENT

Adjust the starting injection quantity (item 1-5) using the adjusting bolt.







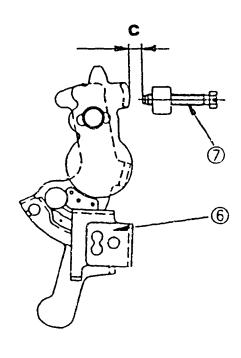


Figure 91

a = Atmospheric temperature

b = Timer stroke

c = Gap between control lever and idling stopper bolt

#### W-CSD ADJUSTMENT

1. Timer Stroke Adjustment (adjust to the thick line)

- 1) Calculate the timer stroke from Fig. 91 according to the atmospheric temperature at the time of adjustment.
- 2) Adjust using the timer stroke adjusting screw so that the timer stroke is as calculated in Step 1.

Figure 92

a = Vertical position

b = Aligning mark

c = Block gauge

**ZEXEL** - Test values **C14** Injection pumps



104748-2381 3/4

#### 2. Intermediate Lever Position Adjustment

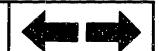
- 1) Insert a block gauge (thickness gauge) of 1.9 ± 0.05 mm thickness between the control lever and the idling stopper bolt.
- 2) Align the intermediate lever with the aligning mark.
- 3) Adjust the intermediate lever set screw so that the control lever and the intermediate lever set screw are in contact, and then fix in position using the locknut.

### 3. CSD Lever Adjustment (adjust to the thick line)

- 1) Calculate the block gauge dimension  $\ell \pm 0.05$  mm from Fig. 91 according to the atmospheric temperature at the time of adjustment.
- 2) Insert the block gauge (thickness gauge) between the control lever and the idling stopper bolt.
- 3) Using the idling bolt, adjust so that the CSD lever roller and the intermediate lever are in contact.

### 4. Final Adjustment

After completing the adjustment, screw the timer stroke adjusting screw two turns clockwise. (Move from the temporary adjustment chart to the final adjustment chart).





- 1. The temperature of the wax must be below 30°C when adjusting.
- 2. When inserting a block gauge (thickness gauge) between the control lever (bracket) and the idling stopper bolt, use the idling adjusting bolt to separate the CSD lever and the intermediate lever so that no excessive force is exerted on them.

$$-10 \le \theta$$
 (°C)  $\le 20$ 

$$TA = -0.0367 \theta + 1.284$$

$$-10 \le \theta$$
 (°C)  $\le 20$ 

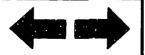
$$\dot{l} = -0.0867 \ \theta + 3.63$$

$$20 \le \theta$$
 (°C)  $\le 40$ 

$$TA = -0.0275 \theta + 1.1$$

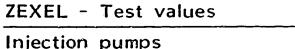
$$20 \le \theta$$
 (°C)  $\le 40$ 

$$l = -0.075 \theta + 3.4$$



Test oil: ZEXEL - TEST VALUES 1/4 TSO 4113 or Distributor pumps BOSCH No. 9 460 610 534 ZEXEL No. Engine model: CD17 104748-2391 SAE J967d Date: 31.10.1992 [2] Company: NISSAN 16700 16A73 (NP-VE4/8F2500LNP164) No. Injection pump no.: 104648-2181 Pump rotation: Counter clockwise viewed from Test-nozzle holder combination: Test pressure line: drive side 1 688 901 000 1 680 750 017 P. Speed Setting values Charge air pressure Difference in 1. Setting values kPa (mmHq) (rpm) delivery (cm<sup>3</sup>) 1-1 Timing device travel 1200 1.8 - 2.4 (mm) 1-2 Supply pump pressure 1200 304-363(3.1-3.7) kPa (kqf/cm<sup>2</sup>) 1-3 Full load delivery 1200  $29.5 - 30.5 \text{ (cm}^3/1000\text{st)}$ 2.5 Full load delivery  $(cm^3/1000st)$ 1-4 Idle speed regulation  $5.3 - 8.3 \text{ (cm}^3/1000\text{st)}$ 400 3.0 1-5 Start 100  $45.3 - 55.3 \text{ (cm}^3/1000\text{st)}$ 1-6 Full-load speed regulation 2700 11.9 - 17.9 (cm<sup>3</sup>/1000st)1-7 Load-timer adjustment 1-8 2. Test values 2-1 Timing device N = rpm1200 1800 2500 1.7 - 2.5 4.0 - 5.2 6.8 - 8.0mm 2-2 Supply pump N = rpm1200 1800 2500 3. Dimensions kPa 294 - 373 431 - 510 598 - 677 (3.0 - 3.8) $(kgf/cm^2)$ (4.4 - 5.2)(6.1 - 6.9)2-3 Overflow delivery N = rpm1200 3.2 - 3.4 mm  $cm^3/10s$ 36.0 - 80.0 KF 5.7 - 5.9 mm 2-4 Fuel injection quantities MS 1.7 - 1.9 mm Pump Speed Fuel delivery BCS Control lever position Charge air pressure mm (rpm) (cm<sup>3</sup>/1000 strokes) Pre-str. kPa (mmHq) Control lever angle 29.0 - 31.0 1200 End stop 600 24.8 - 28.8 1°- -1° deg 2500 26.7 - 30.7 Ya 15.4 - 18.1 mm 2700 11.4 - 18.4 39°- 49° deg 2900 below 6.0 В 11.0 - 16.0 mm 13.5° - 14.5° deg С 8.6 - 9.2 mm Switch off 400 0 4.8 - 8.8 Idle 400 600 below 3.0 stop Partial load 700 10.0 - 20.0 Cut-in voltage max. 8 V 2-5 Solenoid Test voltage: 12 - 14 V







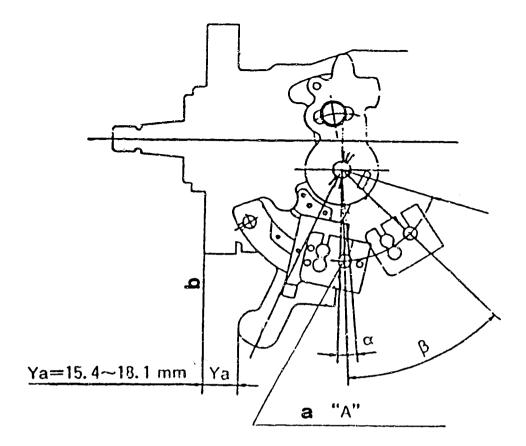


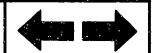
Figure 93

104748-2391 2/4

a = Hole
b = Flange

## CONTROL LEVER ANGLE MEASUREMENT POSITION

1. Measure the control lever angles  $(\alpha,~\beta,~\gamma)$  at hole "A".



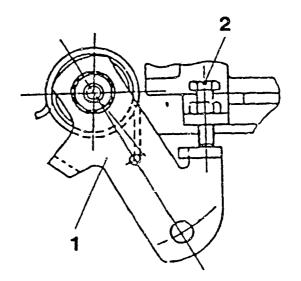


Figure 94

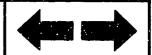
104748-2391 2/4 (continued)

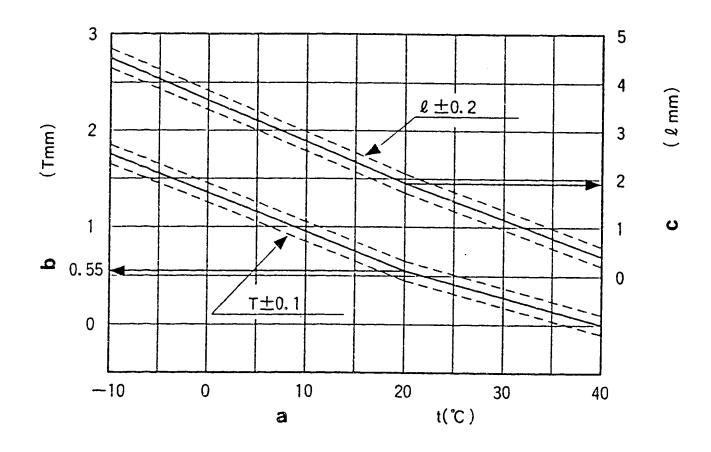
1 = Stop lever

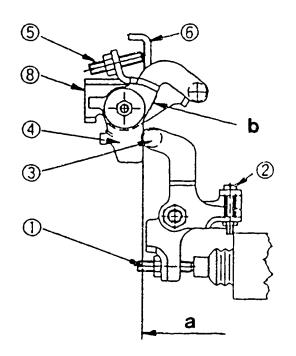
2 = Adjusting bolt

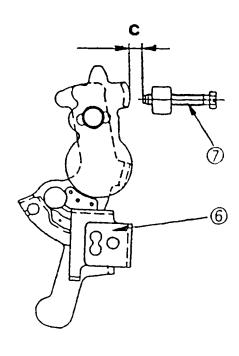
STARTING INJECTION QUANTITY ADJUSTMENT

Adjust the starting injection quantity (item 1-5) using the adjusting bolt.









104748-2391 3/4

Figure 95

a = Atmospheric temperature

b = Timer stroke

c = Gap between control lever
 and idling stopper bolt

### W-CSD ADJUSTMENT

1. Timer Stroke Adjustment (adjust to the thick line)

1) Calculate the timer stroke from Fig. 95 according to the atmospheric temperature at the time of adjustment.

2) Adjust using the timer stroke adjusting screw so that the timer stroke is as calculated in Step 1.

Figure 96

a = Vertical position

b = Aligning mark

c = Block gauge

C24 ZEXEL - Test values
Injection pumps

#### 2. Intermediate Lever Position Adjustment

- 1) Insert a block gauge (thickness gauge) of 1.9  $\pm$  0.05 mm thickness between the control lever and the idling stopper bolt.
- 2) Align the intermediate lever with the aligning mark.
- 3) Adjust the intermediate lever set screw so that the control lever and the intermediate lever set screw are in contact, and then fix in position using the locknut.

#### 3. CSD Lever Adjustment (adjust to the thick line)

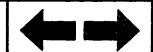
- 1) Calculate the block gauge dimension  $\ell \pm 0.05$  mm from Fig. 95 according to the atmospheric temperature at the time of adjustment.
- 2) Insert the block gauge (thickness gauge) between the control lever and the idling stopper bolt.
- 3) Using the idling bolt, adjust so that the CSD lever roller and the intermediate lever are in contact.

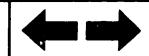
#### 4. Final Adjustment

**ZEXEL** - Test values

Injection pumps

After completing the adjustment, screw the timer stroke adjusting screw two turns clockwise. (Move from the temporary adjustment chart to the final adjustment chart).





- 1. The temperature of the wax must be below 30°C when adjusting.
- 2. When inserting a block gauge (thickness gauge) between the control lever (bracket) and the idling stopper bolt, use the idling adjusting bolt to separate the CSD lever and the intermediate lever so that no excessive force is exerted on them.

$$-10 \le \theta$$
 (°C)  $\le 20$ 

$$TA = -0.0367 \theta + 1.284$$

$$-10 \le \theta$$
 (°C)  $\le 20$ 

$$\ell = -0.0867 \theta + 3.63$$

$$20 \le \theta$$
 (°C)  $\le 40$ 

$$20 \le \theta$$
 (°C)  $\le 40$  TA = -0.0275  $\theta$  + 1.1

$$20 \le \theta$$
 (°C)  $\le 40$ 

$$l = -0.075 \theta + 3.4$$



Distributor pumps

Engine model: C223

BOSCH No. 9 460 610 540 ZEXEL No. 104749-1213 Date: 31.10.1992 [1] Company: ISUZU No. 8942528142

Injection pump no.: 104649-1202 Pump rotation: Counter clockwise-viewed from Test-nozzle holder combination: Test pressure line: 1 688 901 000 drive cide 1 680 750 017

(NP-VE4/9F2175LNP125)

arive side		1 688 301	000	1 680 750 017	
1. 5	1. Setting values		Setting values	Charge-air pressure	I
		(rpm)	<u> </u>	kPa (mmHg)	delivery (cm³)
1-1	Timing device travel	1500	3.8 - 4.2 (mm)		
1-2	Supply pump pressure	1500	510-549(5.2-5.6) kPa (kgf/cm <sup>2</sup> )		
1-3	Full load delivery	1500	37.9 - 38.9 (cm <sup>3</sup> /1000st)		3.0
	Full load delivery		(cm³/1000st)		
1-4	Idle speed regulation	350	5.5 - 9.5 (cm <sup>3</sup> /1000st)		2.0
1-5	Start	100	above 63.0 (cm³/1000st)		
1-6	Full-load speed regulation	2440	10.4 - 16.4 (cm <sup>3</sup> /1000st)		
1-7	ACS adjustment	1500	Decrease 4.8-6.2 (cm <sup>3</sup> /1000st)	-21.9±0.7 (-164±5)	

### 2. Test values

2-1 Timing device	N = rpm	1000	1500	2175	
	mm	1.4-2.6	3.7-4.3	6.1-7.0	Ì
2-2 Supply pump	N = rpm	1000	1500	2175	
	kPa	373-431	510-549	647-706	
	(kgf/cm²)	(3.8-4.4)	(5.2-5.6)	(6.6-7.2)	
2-3 Overflow delivery	N = rpm	1000			
	cm <sup>3</sup> /10s	52.0-95.0			

2-4 Fuel	l injection	n quantities
----------	-------------	--------------

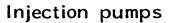
Speed control lever pos.	P. Speed	Fuel delivery	Cnarye-air press.	Difference		
	(rpm)	(cm³/1000st)	kPa (mmHg)	deliv.(cm³)		
End stop	1500	37.4 - 39.4		*···		
	600	28.4 - 32.4				
	1500	Decrease 4.3-6.7	$-21.9\pm0.7 (-164\pm5)$			
	2175	33.3 - 37.5				
	2440	10.4 - 16.4				
	2550	below 6.0				
Switch off	350	0		<u> </u>		
Idle-	350	5.5 - 9.5				
stop	450	below 3.0				
2-5	Cut-in voltage max.:8V					
Solenoid	Test voltage: 12 - 14V					

3 .	D	i	m	е	n	8	i	0	n	8

K 3.2 - 3.4 mm KF 5.7 - 5.9 mm MS 1.7 - 1.9 mm BCS mm Pre-st. mm Control lever angle

CONCION TOVEL		angr	
α	21°-	29°	deg
A	_		mm
β	36.5°-	46.5	°deg
В	-		mm
γ	-		deg
С	-		mm

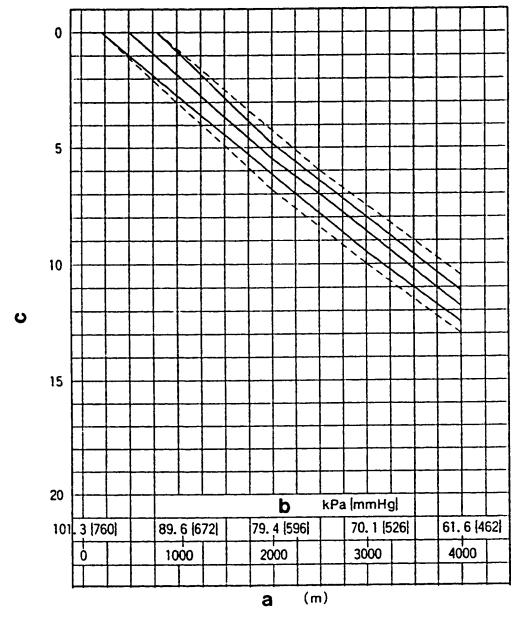






**ZEXEL** - Test values





B =======

Figure 97

104749-1213 2/2

a = Altitude

b = Atmospheric pressure

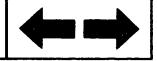
c = Injection quantity decrease (cm<sup>3</sup>/1000st)

A = Adjustment value

B = Inspection value

- FULL-LOAD FUEL INJECTION QUANTITY AND ACS ADJUSTING PROCEDURE AT HIGH ALTITUDES
  - 1. FULL-LOAD FUEL INJECTION QUANTITY ADJUSTMENT
    - 1) Remove the ACS cover, the bellows and the adjusting shims.
    - 2) Perform all adjustments as described in the adjusting specifications, except for ACS adjustment.
  - 2. ACS ADJUSTMENT
    - 1) Attach the ACS cover, the bellows and the adjusting shims.
    - 2) At a pump speed of 1500 rpm and refering to the graph above, use the shims to adjust the fuel injection quantity decrease according to the altitude.

D3 ZEXEL - Test values
Injection pumps



D4 ZEXEL - Test values
Injection pumps



# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	: 9 400 610 187 1/4
ZEXEL No.	: 106672-4572
Date	: 31.10.1992 [3]
Company	: KOMATSU
Engine	: SA6D155 / 6128-71-1035

IP-Type number : 106067-8151 / PES6PD Governor type number : 105448-9362 / EP/RSUV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C : 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 0 681 343 002

Opening pressure bar : 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $2.5 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)

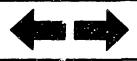
## Injection Quantity:

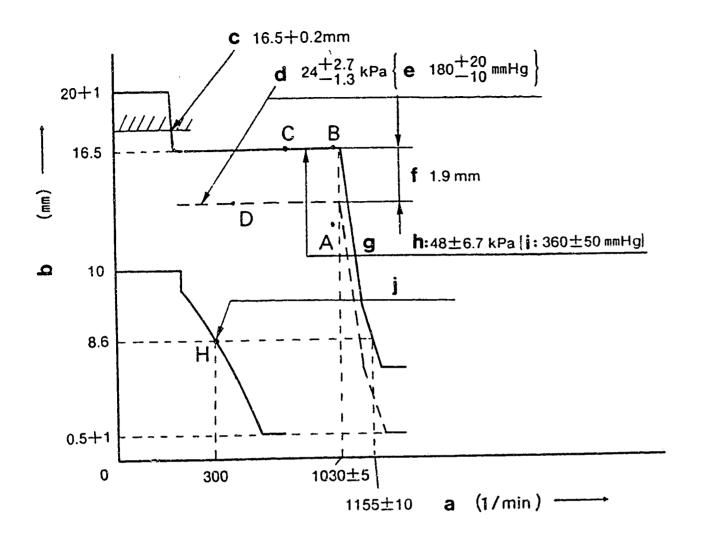
Adjusting Point	Rack Pos.	P. Speed	Injection Q'ty	Difference	Fixed	Remarks
	(mm)	(rpm)	$(cm^3/1000 str.)$	(%)		
A	14.3	1000	250.0 ± 5.0	-	Rack	Basic Each cylinder
Н	8.6	300	28.0 ± 3.0	± 10.0	Rack	
A	14.3	1000	250.0 ± 5.0	<del>-</del>	Lever	Basic Each cylinder
В	16.5	1000	335.0 ± 2.0	<del>-</del>	Lever	
С	16.5	700	315.0 ± 5.0		Lever	
D	14.6	400	254.0 ± 5.0		Lever	

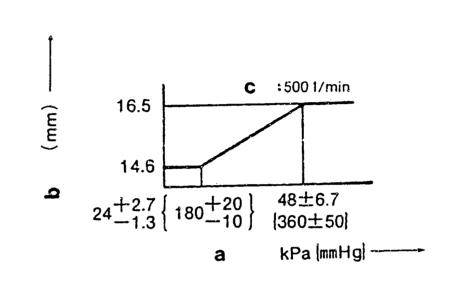
## Timing Advance Specification:

ZEXEL - Test values

Pump Speed (rpm)			
Advance			
Angle (deg)		:	







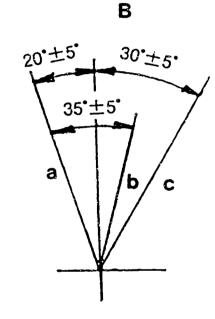


Figure 98 GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 18
Perform torque control spring adjustment when necessary

106672-4572 2/4

a = Pump speed

b = Control rack position

c = Control rack limit setting:

d = Boost pressure: e = below:

f = Boost compensator stroke:

g = Boost pressure: h/i = above:

j = Idle setting

(Using boost pressure 0)

A = BOOST COMPENSATOR ADJUSTMENT

a = Boost pressure

b = Control rack position

c = Pump speed:

B = Speed Control Lever Angle

a = Full-speed

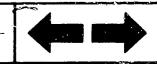
b = Idling

c = Stop

**D8** 



D9



#### Note

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

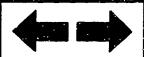
## ADJUSTMENT

	<del></del>	Pump Speed	Rack Position	Boost pressure	Remarks
		(rpm)	(mm)	kPa (mmHg)	
Full-load Adjus	tment	1230	16.5	0	Adjust using screw (2)
(Temporary)		700	16.5	0	• Adjust using screw (1)
Torque Control	1.st stroke	-	-	_	Adjust using spring capsule (4)
Spring Adjust-					• Confirm
ment					• Confirm the torque control stroke
					is: (mm)
	2.st stroke	-	-	-	Adjust using spring capsule (4)
				•	• Confirm
					• Confirm the torque control stroke
					is: (mm)
Maximum Speed A	djustment	1030	16.5	-	• Fix the control lever
		1155 ± 10	8.6		Confirm speed droop -
					adjust using screw (3)
					• Confirm
Boost Compensate	or System	500	14.6	24+2.7	Fix the control lever
	<b>*</b> ,			-1.3	
				(180+20)	Adjust using screw (6)
		500		-10	
		500	16.5	48 ± 6.7	Confirm the boost compensator
	<del></del>			(360 ± 50)	stroke is: 1.9 mm
Idling Adjustmen		0	10.0	0	Fix the control lever
1. Idling Sub Sp	oring	300	8.6	0	Adjust using spring capsule (5)
		above 500	0.5 ± 1	0	• Confirm
2. Control Lever	r	-	-	-	Adjust using the control lever
Full-load Adjust	tment	1030	16.5	above	• Confirm
				48 ± 6.7	
				$(360 \pm 50)$	
Control Lever Ar	ngle				g" and "full" positions.
Measurement					e "full" position, replace the
		8	m with a thicker		
					e "idling" position, replace the
		shifter's shi	m with a thinner	one.	
Control Rack Lin	niter	-	16.5 + 0.2	-	Adjust using screw
Adjustment					

ZEXEL - Test values

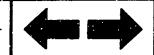
Injection pumps

D10



**N11** 

ZEXEL - Test values



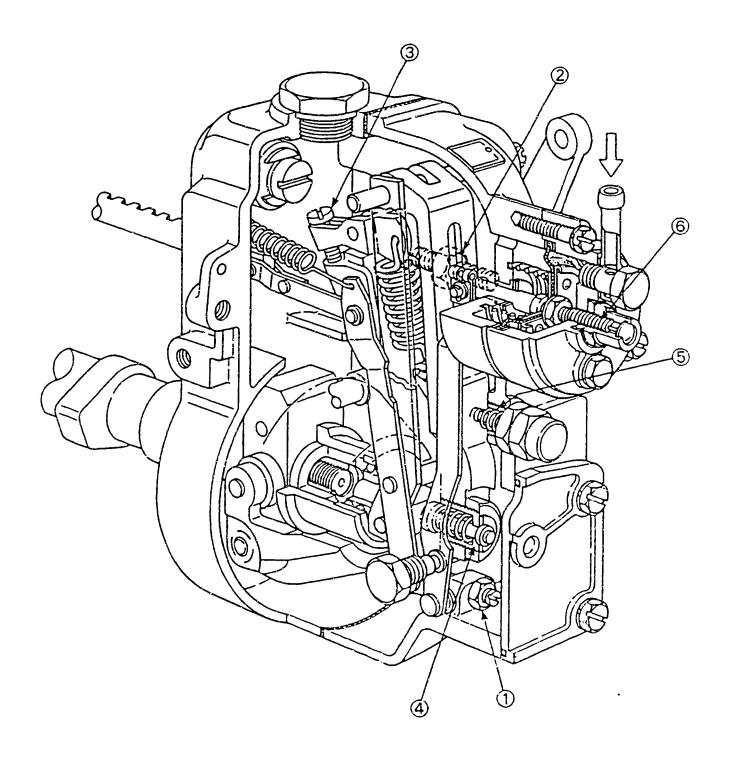


Figure 99

1 = Screw

2 = Screw

3 = Screw

4 = Spring capsule

5 = Spring capsule

6 = Screw

106672-4572 4/4



**D13** 

# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	:	9 400 610 225	1/4
ZEXEL No.	:	106672-4591	
Date	:	31.10.1992	[4]
Company	:	KOMATSU	
Engine	٠	SA6D155 / 6128-7	1-1084

IP-Type number : 106067-8151 / PES6PD Governor type number : 105448-9362 / EP/RSUV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 0 681 343 002

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $2.5 \pm 0.05$ 

Rod position mm : -.

Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW : 0-60-120-180-240-300

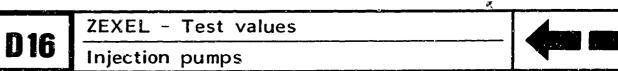
Tolerance +- °C: 0.50 (0.75)

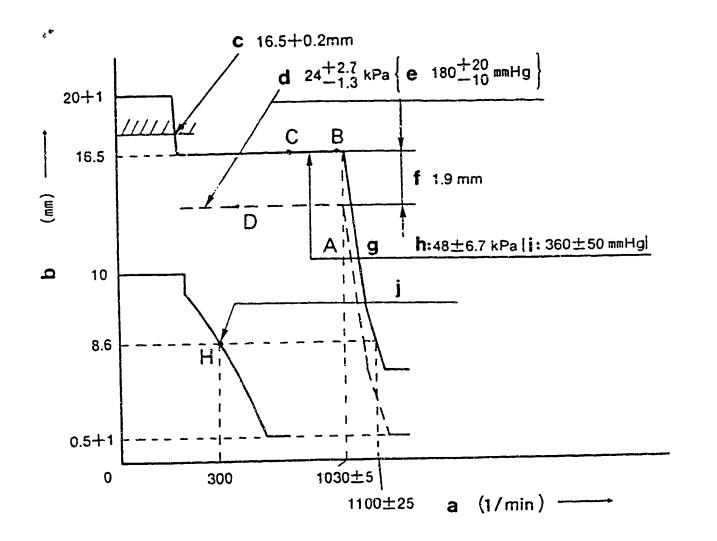
## Injection Quantity:

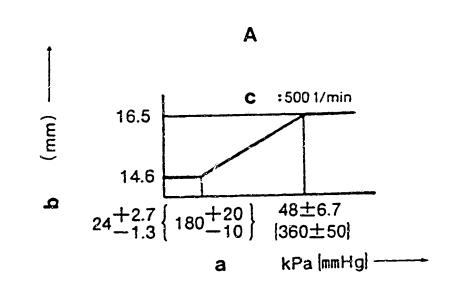
Adjusting Point	Rack Pos.	P. Speed	Injection Q'ty	Difference	Fixed	Remarks
	(mm)	(rpm)	$(cm^3/1000 str.)$	(왕)		
A	14.3	1000	250.0 ± 5.0	-	Rack	Basic Each cylinder
Н	8.6	300	28.0 ± 3.0	± 10.0	Rack	
A	14.3	1000	250.0 ± 5.0	-	Lever	Basic Each cylinder
В	16.5	1000	335.0 ± 2.0	-	Lever	Boost pressure kPa (mmHg) above 48±6.7 (above 360±50)
С	16.5	700	315.0 ± 5.0	-	Lever	Boost pressure kPa (mmHg) above 48±6.7 (above 360±50)
D	14.6	400	254.0 ± 5.0	-	Lever	
						·

## Timing Advance Specification:

Pump Speed (rpm)			
Advance			
Angle (deg)			







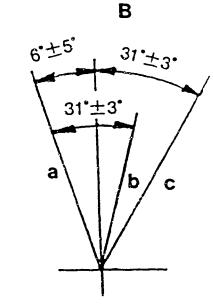


Figure 100 GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 10 Perform torque control spring adjustment when necessary

106672-4591 2/4

a = Pump speed

b = Control rack position

c = Control rack limit setting:

d = Boost pressure: e = below:

f = Boost compensator stroke:

g = Boost pressure: h/i = above:

j = Idle setting

(Using boost pressure 0)

A = BOOST COMPENSATOR ADJUSTMENT

a = Boost pressure

b = Control rack position

c = Pump speed:

B = Speed Control Lever Angle

a = Full-speed

b = Idling

c = Stop

**D17** 

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 - 1.0 mm.

### ADJUSTMENT

			Pump Speed	Rack Position	Boost pressure	Remarks
			(rpm)	(mm)	kPa (mmHg)	Remarks
Full-load Adjus	tment	<del></del>	1230	16.5	0	Adjust using screw (2)
l .	(Temporary)		700	16.5		• Adjust using screw (2) • Adjust using screw (1)
L	Torque Control   1.st stroke		700			
Spring Adjust-	1.80 801	OKE	_		-	<ul><li>Adjust using spring capsule (4)</li><li>Confirm</li></ul>
ment			1			
menc	i					• Confirm the torque control stroke is: (mm)
Ì	2.st str	- le o		<del></del>		<u> </u>
	Z.St Str	oke			-	Adjust using spring capsule (4)
						• Confirm
	<u> </u>					<ul><li>Confirm the torque control stroke is: (mm)</li></ul>
Maximum Speed A	djustment		1030 ± 5	16.5	-	• Fix the control lever
			1100 ± 25	8.6		Confirm speed droop -
						adjust using screw (3)
						• Confirm
Boost Compensat	or System		500	14.6	24+2.7	• Fix the control lever
					-1.3	
					(180+20)	<ul><li>Adjust using screw (6)</li></ul>
ļ					-10	
			500	16.5	48 ± 6.7	Confirm the boost compensator
<u>.</u>					(360 ± 50)	stroke is: 1.9 mm
Idling Adjustme	nt		0	10.0	0	Fix the control lever
1. Idling Sub S	pring	н	300	8.6	0	Adjust using spring capsule (5)
		1	above 500	0.5 ± 1	0	• Confirm .
2. Control Leve	r		-	-	-	Adjust using the control lever
Full-load Adjus	tment	<u> </u>	1100	16.5	above 48 ± 6.7	• Confirm
					(360 ± 50)	
Control Lever A	ngle		• Measure the	control lever ang	le at the "idlin	g" and "full" positions.
Measurement						e "full" position, replace the
				im with a thicker		•
			• When the cont	rol lever is depr	ressed toward th	e "idling" position, replace the
	shifter's shim with a thinner one.					
Control Rack Li	miter		-	16.5	-	Adjust using screw
Adjustment						<u> </u>
	بمريونيون والمساوي		سيبيت ميروسون بيروس والمروس والمراوي والمراوي والمراوي	والمراجع المساور والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع		I.

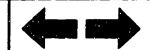
ZEXEL - Test values

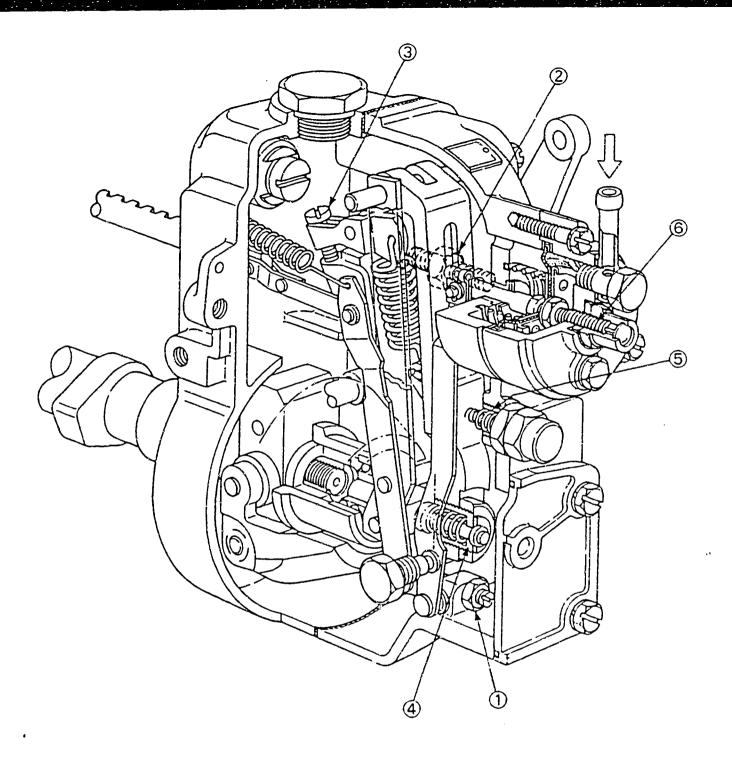
Injection pumps



ZEXEL - Test values

D 20 Injection pumps





106672-4591 4/4

Figure 101

1 = Screw

2 = Screw

3 = Screw

4 = Spring capsule

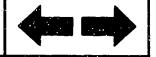
5 = Spring capsule

6 = Screw

ZEXEL - Test values

Injection pumps

**D21** 



D22

ZEXEL - Test values



# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	:	9 400 610 226	1/4
ZEXEL No.	:	106672-9124	
Date	:	31.10.1992	[2]
Company	:	KOMATSU	
Engine	:	SA6D125 / 6152-	71-1191

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 0 681 343 002

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $3.8 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)

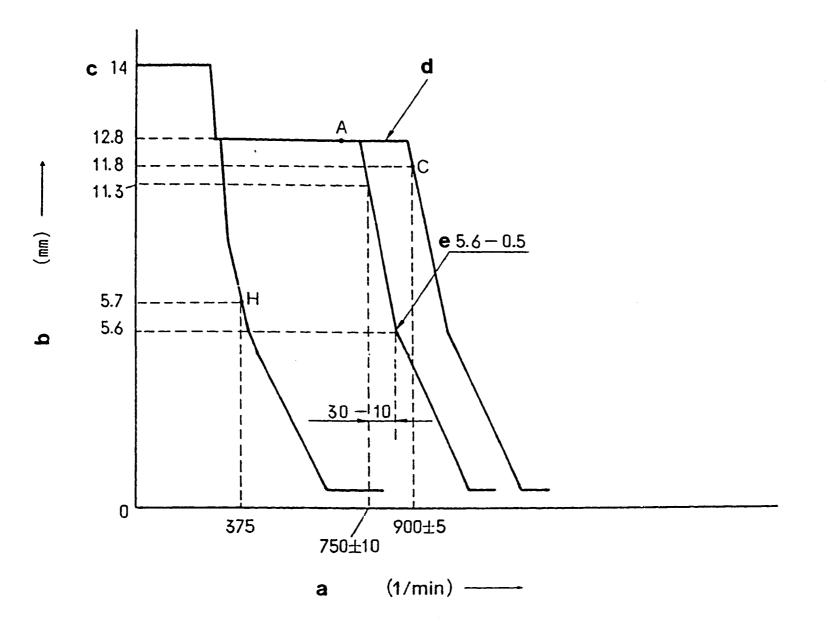
## Injection Quantity:

Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm <sup>3</sup> /1000 str.)	Difference (%)	Fixed	Remarks
A	12.8	700	305.4 ± 2.0	± 3.0	Lever	Basic
Н	approx. 5.7	375	14.6 ± 1.5	± 15.0	Rack	
А	12.8	700	305.4 ± 2.0	<u>-</u>	Lever	Basic
C	11.8	900	(264.7)	-	Lever	
				:		
					<u> </u>	

## Timing Advance Specification:

Pump Speed			
(rpm)			
Advance			
Angle (deg)			

ZEXEL - Test values



a 6°±/5° 22°±5° 2°±5° b 750 1/min d 900 1/min

Figure 102

a = Pump speed

o = Control rack position

c = Above

**E4** 

d = Perform torque control spring
 adjustment when necessary

e = Idle-sub spring setting:

GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 12

A = Speed Control Lever Angle

a = Idling

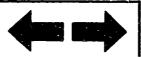
b = Setting:

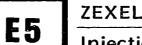
c = Full-speed

d = Setting:

(on our shipment)

ZEXEL - Test values
Injection pumps





**ZEXEL** - Test values

Injection pumps

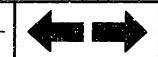


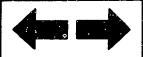
106672-9124

- Note
- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 - 1.0 mm.

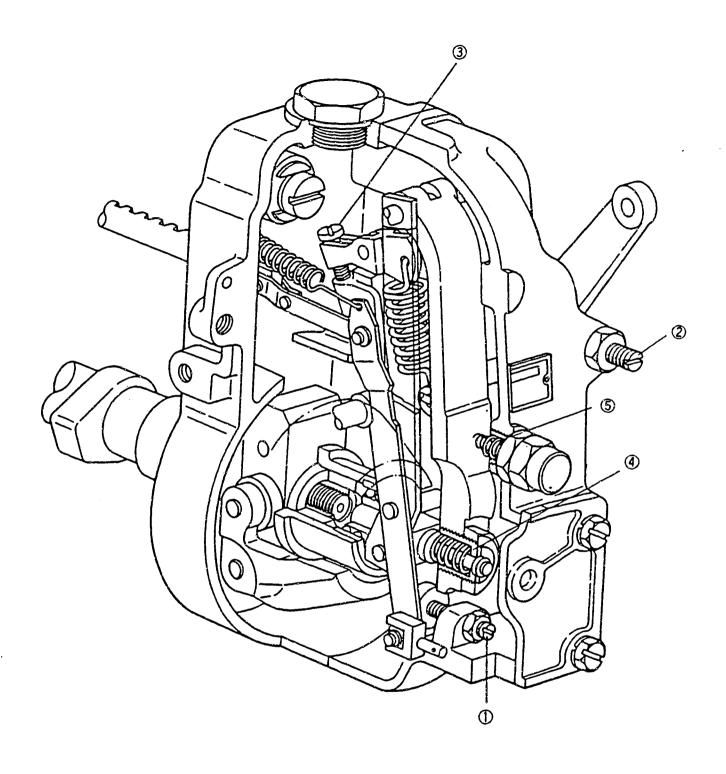
### ADJUSTMENT

	Pump speed	Rack position	Remarks
•	(rpm)	(mm)	
Full-load Adjustment	1100	12.8	Adjust using screw (2)
(Temporary)	600	12.8	Adjust using screw (1)
Torque Control spring Adjustment	<del>-</del>	<del>-</del>	<ul> <li>Adjust using spring capsule (4)</li> <li>Confirm</li> <li>Confirm the torque control stroke is: (mm)</li> </ul>
Idling Adjustment	750+30	5.6 -0.5	Fix the control lever
	+20 375	5.7	<ul><li>Adjust using spring capsule (5)</li><li>Adjust using control lever</li></ul>
Maximum-speed Adjustment	750 ± 10	11.3	Fix the control lever
	750+30 +20	5.6	<ul> <li>Confirm speed droop - adjust using screw (3)</li> </ul>
	900 ± 5	11.8	<ul> <li>Confirm</li> <li>Fix the control lever</li> <li>Adjust using screw (3)</li> </ul>
Full-load Adjustment	850	12.8	• Confirm
Control Lever Angle Measurement	shim with a thicker one.	pressed toward the "f	and "full" positions. Eull" position, replace the shifter's Edding" position, replace the shifter's
Rack Limiter Adjustment		T	Adjust using screw





ZEXEL - Test values



106672-9124 4/4

Figure 103

1 = Screw

2 = Screw

3 = Screw

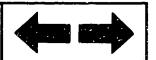
4 = Spring capsule

5 = Spring capsule

ZEXEL - Test values

Injection pumps

**E8** 



ZEXEL - Test values E9



# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	: 9 400 610 227 1/4
ZEXEL No.	: 106672-9183
Date	: 31.10.1992 [3]
Company	: KOMATSU
Engine	: S6D140 / 6211-71-1311

 IP-Type number
 : 106060-5451 / PE6P

 Governor type number
 : 105407-2901 / EP/RSV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 1 688 901 013

Opening pressure bar : 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $4.3 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)



## Injection Quantity:

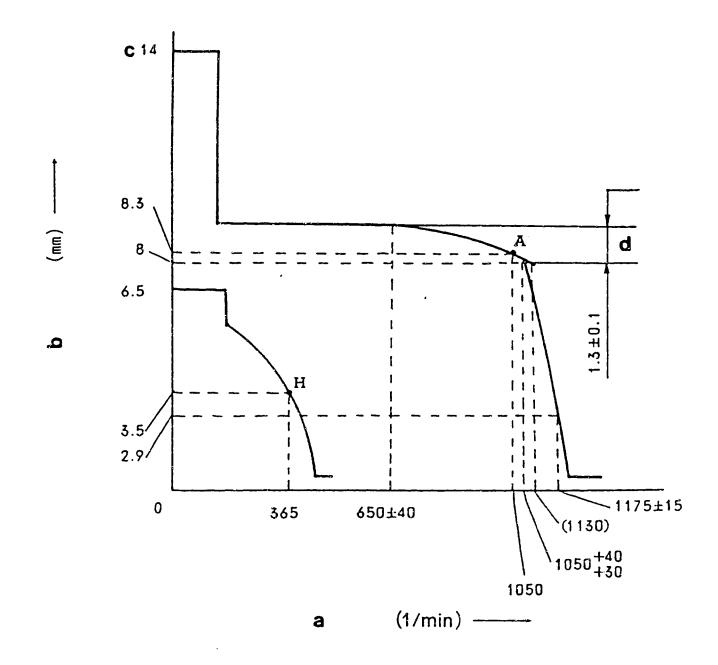
Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm <sup>3</sup> /1000 str.)	Difference (%)	Fixed	Remarks
A	8.3	1050	133.9 ± 2.0	± 3.0	Lever	Basic
Н	approx. 3.5	365	11.5 ± 1.5	± 15.0	Rack	
A	8.3	1050	133.9 ± 2.0	_	Lever	Basic

## Timing Advance Specification:

Pump Speed		<u> </u>		
(rpm)				
Advance			<del></del>	
Angle (deg)				

ZEXEL - Test values
Injection pumps

E12



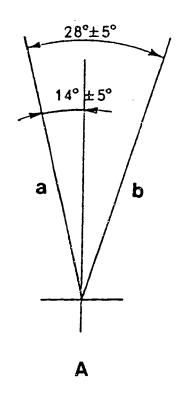


Figure 104

a = Pump speed

b = Control rack position

c = Above

E13

d = Difference in control rack position
 between 1200 rpm and 600 rpm

GOVERNOR ADJUSTMENT

106672-9183 2/4

Recommended speed droop adjustment screw position: 16

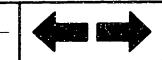
A = Speed Control Lever Angle

a = Full-speed

b = Idling

E14

**ZEXEL** - Test values



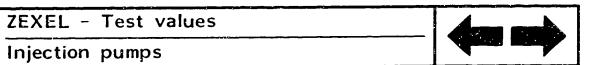
#### Note

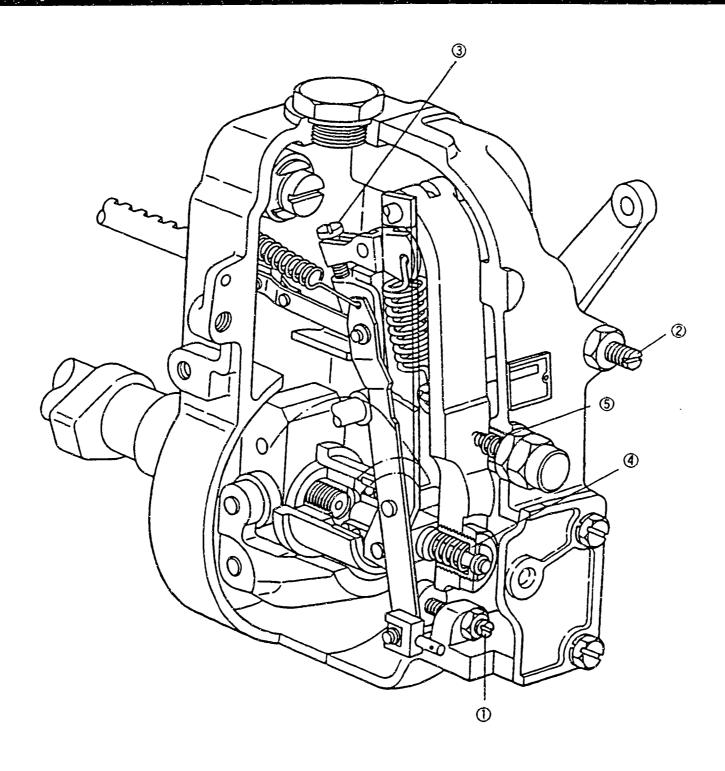
- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

### ADJUSTMENT

Pump speed	Rack position	Remarks
(rpm)	(mm)	
1200	8.0	Adjust using screw (2)
700	8.0	Adjust using screw (1)
550	9.3	Adjust using spring capsule (4)
650 ± 40	9.3	• Confirm
1050	8.3	• Confirm the torque control stroke
approx. 1130	8.0	is 1.3 $\pm$ 0.1 mm
0	6.5	• Fix the control lever
365	3.5	• Adjust using spring capsule (5)
		• Confirm
1050+40	8.0	• Fix the control lever
+30		Grantium annotal dancer
1175 ± 15	2.9	<ul> <li>Confirm speed droop - adjust using screw (3)</li> </ul>
		• Confirm
	-	• Confirm
Measure the control lever and	late at the "idling" a	and "full" positions.
shim with a thicker one.		
When the control lever is dep	pressed toward the "i	dling" position, replace the shifter's
shim with a thinner one.		
-	-	Adjust using screw
•	(rpm)  1200 700  550 650 ± 40 1050 approx. 1130  0 365  1050+40 +30 1175 ± 15  • Measure the control lever and • When the control lever is deposite with a thicker one. • When the control lever is deposite with a thicker one. • When the control lever is deposite with a thicker one.	(rpm)       (mm)         1200       8.0         700       8.0         8.0       9.3         650 ± 40       9.3         1050       8.3         approx. 1130       8.0         0       6.5         365       3.5         1050+40       8.0         +30       1175 ± 15         2.9     • Measure the control lever angle at the "idling" at the "idling" at the with a thicker one.      • When the control lever is depressed toward the "idling" at the with a thicker one.      • When the control lever is depressed toward the "idling" at the with a thicker one.          • When the control lever is depressed toward the "idling" at the with a thicker one.







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Figure 105

1 = Screw

2 = Screw

3 = Screw

4 = Spring capsule

5 = Spring capsule



# ZEXEL - TEST VALUES Injection pumps

: 9 400 610 228 1/4
: 106672-9562
: 31.10.1992 [1]
: KOMATSU
: S6D140 / 6211-71-1660
_

IP-Type number : 106060-7070 / PE 6P Governor type number : 105447-1250 / EP/RSUV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar: 1.6

Test nozzle holder combination: 0 681 343 002

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $4.3 \pm 0.05$ 

Rod position mm : -

Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)



## Injection Quantity:

Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm <sup>3</sup> /1000 str.)	Difference (%)	Fixed	Remarks
A	11.7	900	268.6 ± 4.0	± 3.0	Lever	Basic
Н	approx. 5.8	400	20.7 ± 1.5	± 15.0	Rack	_
A	11.7	900	268.6 ± 4.0	-	Lever	Basic
		-				

## Timing Advance Specification:

1	Pump Speed (rpm)			
7	Advance			 
	Angle (deg)			

ZEXEL - Test values

**E20** 

Injection pumps

ZEXEL - Test values

E21



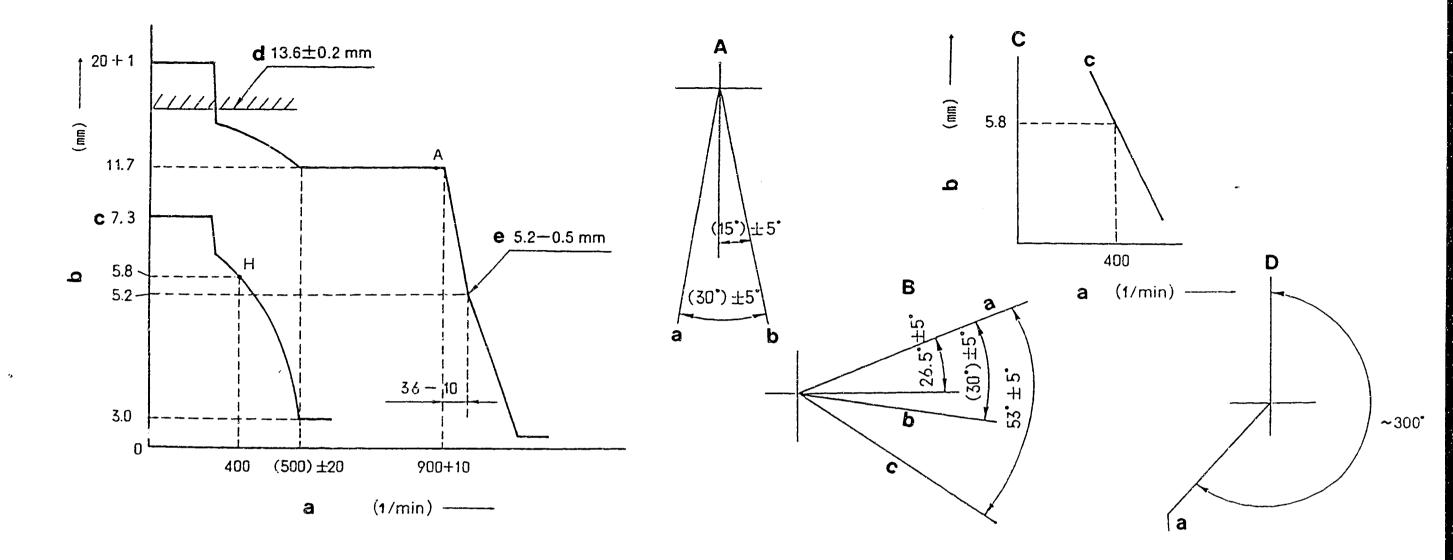


Figure 106

## Minimum-Maximum Speed Specification

a = Pump speed

b = Control rack position

c = Above

d = Control rack limit:

e = Idle-sub spring setting:

GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 17

A = Speed Control Lever Angle

a = Idling

b = Full-speed

B = Load-Control Lever Angle

a = Full-load

b = Idling

c = Stop

C = Variable Speed Specification

106672-9562 2/4

a = Pump speed

b = Control rack position

c = Idle setting

D = TIMING SETTING

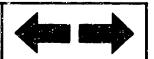
At No. 1 plunger's beginning of injection position.

a = Coupling key groove position

ZEXEL - Test values

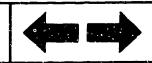
Injection pumps

**E22** 



E 23

ZEXEL - Test values



- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

#### ADJUSTMENT

			Pump Speed	Rack Position	Boost pressure	Remarks
			(rpm)	(mm)	kPa (mmHg)	1011112710
Full-load Adjustment		1100	11.7		Adjust using screw (2)	
(Temporary)			700	11.7		Adjust using screw (1)
Torque Control	1.st str	oke	approx. 500	11.7	<del> </del>	Adjust using spring capsule (4)
Spring Adjust-						• Confirm
ment						Confirm the torque control stroke
						is: (mm)
	2.st str	oke	-	-	_	Adjust using spring capsule (4)
						• Confirm
						Confirm the torque control stroke
						is: (mm)
Maximum-speed A	djustment		900 + 10	11.7	-	Fix the control lever
ł			900+36	5.2		Confirm speed droop -
			+26			adjust using screw (3)
						• Confirm
Boost Compensat	or System		-	-	-	Fix the control lever
İ						Adjust using screw (6)
						Confirm the boost compensator
						stroke is: (mm)
Idling Adjustme			0	7.3	-	Fix the control lever
1. Idling Sub S	pring	İ	900+36	5.2		• Adjust using spring capsule (5)
		j	+26			
		-	above 550	3.0		• Confirm
2. Control Leve	r	H	400	5.8	-	Adjust using the control lever
		<u></u>				
Full-load Adjus	tment		-	-	-	• Confirm
Control Lever Angle					g" and "full" positions.	
Measurement			1			e "full" positiòn, replace the
			1	m with a thicker		
				rol lever is depr Im with a thinner		e "idling" position, replace the
Control Rack Li	miter		0	13.6 ± 0.2		Adjust using screw
Adjustment						,
				<u> </u>	L	

**E 24** 



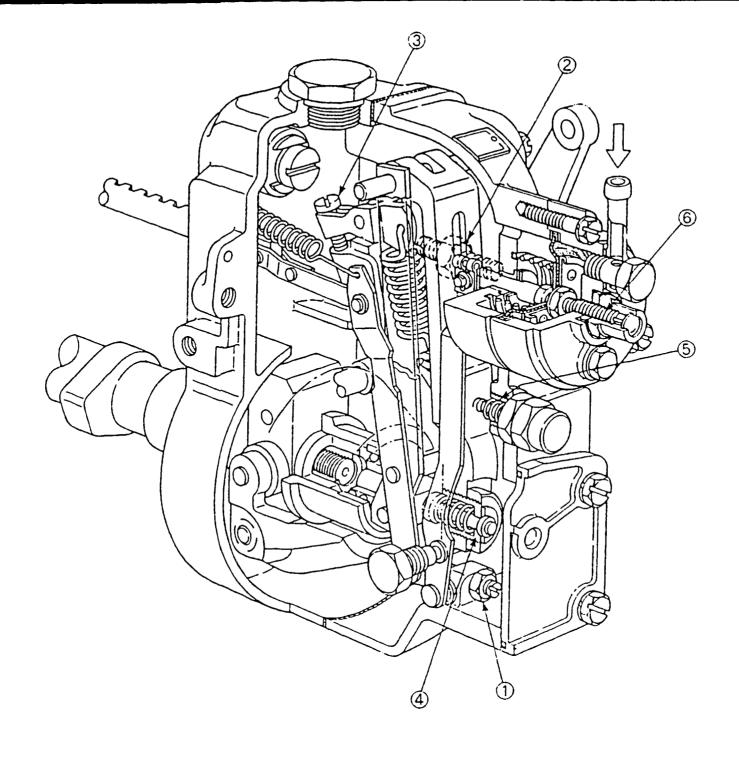


Figure 107

1 = Screw

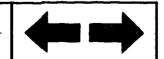
3 = Screw

4 = Spring capsule

5 = Spring capsule

6 = Screw

106672-9562 4/4



**E27** 

ZEXEL - Test values

Injection pumps



# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	: 9 400 610 230 1/4
ZEXEL No.	: 106692-4123
Date	: 31.10.1992 [4]
Company	: KOMATSU
Engine	: SA6D170 / 6162-73-1253

IP-Type number : 106069-8031 / PES6PD Governor type number : 105448-9502 / EP/RSUV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 0 681 343 002

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $2.4 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

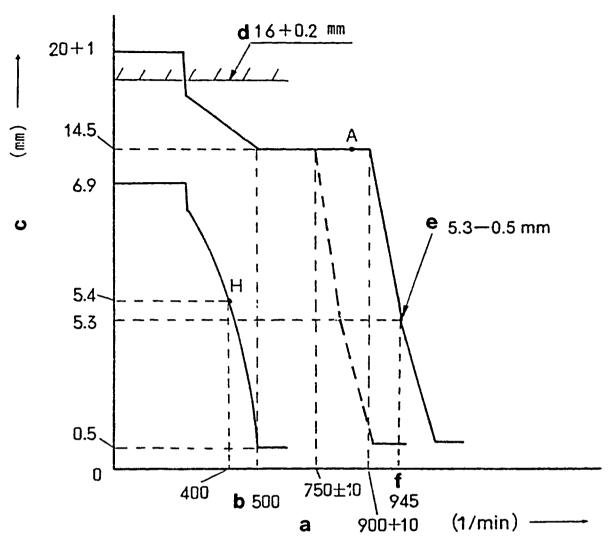
Tolerance +- °C: 0.50 (0.75)

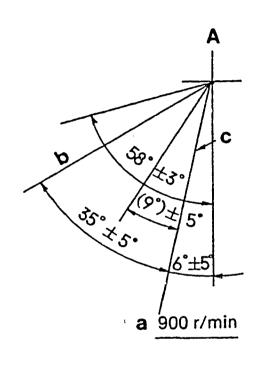
## Injection Quantity:

Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm <sup>3</sup> /1000 str.)	Difference (%)	Fixed	Remarks
A	14.5	900	472.5 ± 5.0	-	Lever	Basic
Н	approx. 5.4	400	39.5 ± 5.0	± 10	Rack	
А	14.5	900	472.5 ± 5.0	-	Lever	Basic

### Timing Advance Specification:

Pump Speed			
(rpm)	 	 	 
Advance			
Angle (deg)			





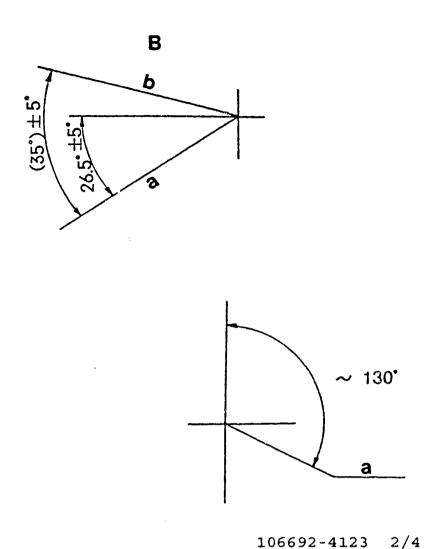


Figure 108

a = Pump speed

b = Above

c = Control rack position

d = Above

e = Control rack limit:

f = dle-sub spring setting:

g = Below

F4

GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 13

A = Control Lever Angle

a = Setting:

(on our shipment)

b = Idling

c = Full-speed

B = STOP LEVER ANGLE

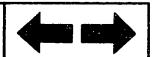
a = Full-load

b = Idling

### TIMING SETTING

At No. 1 plunger's beginning of injection position.

a = Gear coupling's aligning mark
 position (on key groove)



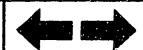




- Note
- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

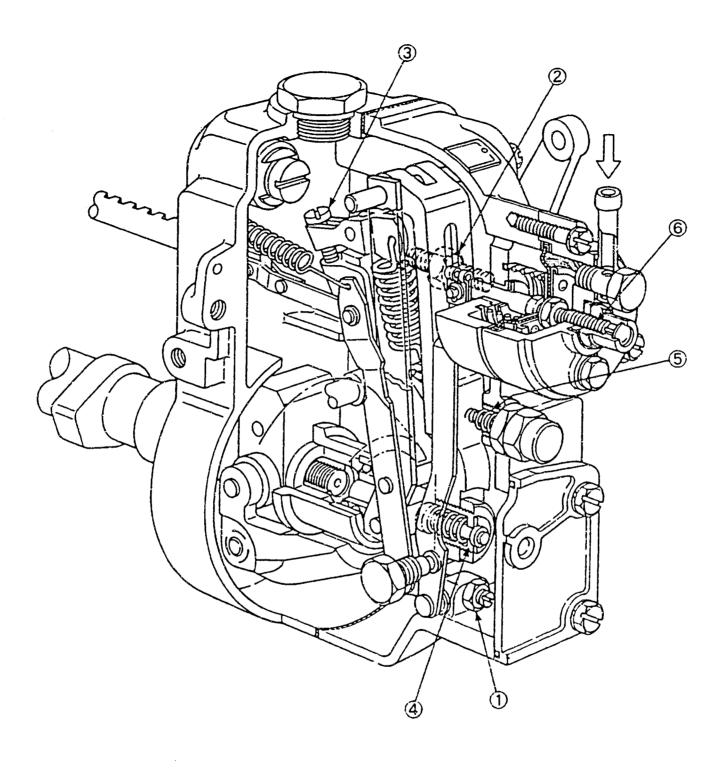
#### ADJUSTMENT

Control Rack Limiter   Control Lever Angle   Control Lever Angle Spring   Control Lever Angle Measurement   Control Lever Angle Measurement   Control Lever Angle Measurement   Control Lever Angle Measurement   Control Lever Angle Measurement   Control Lever Angle Measurement   Control Lever Angle Measurement   Control Lever as shifter's shim with a thinker one.   Control Rack Limiter   Control Rack Limiter   Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever Majust using screw (Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever Majust using screw (Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever Majust using screw (Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever Majust using screw (Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.   Control Lever is depressed toward the "full" position, replace the shifter is shim with a thinker one.   Control Lever is depressed toward the "full" position, replace the shifter   Control Lever   Control Lever   Control Lever   Control Lever   Co			·····	Pump Speed	Rack Position	Boost pressure	Remarks
Full-load Adjustment				1	(mm)	_	
Temporary	Full-load Adjus	tment		_ <del></del>	14.5		Adjust using screw (2)
Torque Control Spring Adjust using spring capsule (4)  Spring Adjust using spring capsule (4)  Confirm  Confirm the torque control stroke is: (mm)  2.st stroke  2.st stroke	i -			700	14.5		
Spring Adjustment  2.st stroke  2.st stroke  2.st stroke  300 ± 10  below 945  5.3  300 ± 10  below 945  5.3  400  Confirm  Confirm the torque control stroke is: (mm)  Fix the control lever  Adjust using screw (3)  Confirm  Confirm the torque control stroke is: (mm)  Fix the control lever  Adjust using screw (3)  Confirm  Confirm the boost compensator stroke is: (mm)  Fix the control lever  Adjust using screw (6)  Confirm the boost compensator stroke is: (mm)  Fix the control lever  Adjust using screw (6)  Confirm  Adjust using spring capsule (5)  Confirm  Control Lever  H  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  5.4  400  Adjust using the control lever  Confirm  Confir		1.st str	oke	-	-	~	
### Confirm the torque control stroke is: (mm)  2.st stroke							· · · · · · · · · · · · · · · · · · ·
2.st stroke  2.st stroke  2.st stroke  - Adjust using spring capsule (4) - Confirm the torque control stroke is: (mm)  500 ± 10     below 945     5.3  - Fix the control lever - Confirm speed Adjust using screw (3) - Confirm  Confirm  Boost Compensator System  Fix the control lever - Adjust using screw (6) - Confirm the boost compensator - Stroke is: (mm)  1dling Adjustment - Fix the control lever - Adjust using spring capsule (5) - Confirm  2. Control Lever - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (4) - Confirm  - Adjust using spring capsule (4) - Confirm  - Adjust using spring capsule (4) - Confirm  - Adjust using spring capsule (5) - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm  - Adjust using spring capsule (5) - Confirm - Adjust using spring capsule (5) - Confirm - Adjust using spring capsule (5) - Confirm - Adjust using spring capsule (5) - Confirm - Adjust using spring capsule (5) - Confirm - Adjust using spring capsule (5) - Confirm - Adjust using spring	1 -						• Confirm the torque control stroke
Confirm the torque control stroke is: (mm)						İ	is: (mm)
Maximum-speed Adjustment  900 ± 10 below 945  5.3  - Fix the control lever Confirm speed droop - adjust using screw (3) Confirm  Confirm the boost compensator System  - Fix the control lever Adjust using screw (6) Confirm the boost compensator stroke is: (mm)  - Fix the control lever Adjust using screw (6) Confirm the boost compensator stroke is: (mm)  - Fix the control lever Adjust using spring capsule (5) Confirm  - Adjust using the control lever Adjust using the control lever Adjust using the control lever Confirm  - Control Lever Angle  Measurement  - Measure the control lever angle at the "idling" and "full" positions.  When the control lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.  - When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  - Adjust using spring capsule (5) - Confirm  - Adjust using the control lever is depressed toward the "full" position, replace the shifter's shim with a thinker one.  - When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.		2.st str	oke	-	~	-	Adjust using spring capsule (4)
Maximum-speed Adjustment  900 ± 10 below 945 5.3  Boost Compensator System							• Confirm
Maximum-speed Adjustment    900 ± 10   below 945   5.3							• Confirm the torque control stroke
below 945    Solution							is: (mm)
Boost Compensator System	Maximum-speed A	djustment	:	900 ± 10	1	-	
Boost Compensator System				below 945	5.3		
Boost Compensator System							
Adjust using screw (6) Confirm the boost compensator stroke is: (mm)  Idling Adjustment 1. Idling Sub Spring  below 945 5.3 -0.5 - Fix the control lever Adjust using spring capsule (5) Confirm  2. Control Lever  M 400 5.4 400 5.4 - Confirm  Confirm  Full-load Adjustment  900 14.5 - Confirm  Measure the control lever angle at the "idling" and "full" positions. When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.  When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  0 16 + 0.2 - Adjust using screw  Adjust using screw							• Confirm
Adjust using screw (6) Confirm the boost compensator stroke is: (mm)  Idling Adjustment 1. Idling Sub Spring  below 945 5.3 -0.5 - Fix the control lever Adjust using spring capsule (5) Confirm  2. Control Lever  M 400 5.4 400 5.4 - Confirm  Confirm  Full-load Adjustment  900 14.5 - Confirm  Measure the control lever angle at the "idling" and "full" positions. When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.  When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  0 16 + 0.2 - Adjust using screw  Adjust using screw				ļ			
Confirm the boost compensator stroke is: (mm)	Boost Compensat	or System	1	-	-	-	
Tdling Adjustment  1. Idling Sub Spring  2. Control Lever  H  400  above 500  Tull-load Adjustment  900  14.5  Measure the control lever angle at the "idling" and "full" positions.  When the control lever is depressed toward the "full" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  5.3 -0.5  Fix the control lever  Adjust using spring capsule (5)  Confirm  Adjust using the control lever  Confirm  Measure the control lever angle at the "idling" and "full" positions.  When the control lever is depressed toward the "full" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  0  16 + 0.2  - Adjust using screw							•
Idling Adjustment  1. Idling Sub Spring  2. Control Lever  H  O  above 6.9  Full-load Adjustment  900  14.5  Measure the control lever angle at the "idling" and "full" positions.  When the control lever is depressed toward the "full" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  O  16 + 0.2  Fix the control lever Adjust using spring capsule (5)  Confirm  Confirm  Confirm  Confirm  O  Adjust using the control lever Confirm  Confirm  Adjust using the control lever Confirm  Confirm  O  Adjust using spring capsule (5)  Confirm  Confirm  O  Adjust using spring capsule (5)  Confirm  Confirm  O  Adjust using spring capsule (5)  Confirm  Adjust using spring capsule (5)  Confirm  Confirm  O  Adjust using spring capsule (5)  Confirm  Adjust using spring capsule (5)  Confirm  O  Adjust using spring capsule (5)  Confirm  O  Adjust using spring capsule (5)  Confirm						}	i -
1. Idling Sub Spring  2. Control Lever  H  O  Above 6.9  400  Above 500  D  Confirm  Confirm  Control Lever Angle  Measure the control lever angle at the "idling" and "full" positions.  When the control lever is depressed toward the "full" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  O  Adjust using spring capsule (5)  Confirm  Confirm  Confirm  Measure the control lever  Shifter's shim with a thicker one.  When the control lever is depressed toward the "full" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  O  16 + 0.2  Adjust using spring capsule (5)  Confirm  Adjust using spring capsule (5)  Confirm  Adjust using spring capsule (5)  Confirm  Adjust using spring capsule (5)  Confirm  Confirm  Adjust using spring capsule (5)  Confirm  Confirm  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Confirm  Confirm  O  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)  Adjust using spring capsule (5)	Idling Adjustme	<u> </u>	<del></del>	holow 945	E 2 - 0 E		
Control Lever  H  Ado above 500  Full-load Adjustment  O Measure the control lever angle at the "idling" and "full" positions.  When the control lever is depressed toward the "full" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  O  16 + 0.2  - Adjust using the control lever Confirm  Confirm  Confirm  Confirm  Confirm  Confirm  Confirm  Adjust using the control lever Confirm  Confirm  Confirm  Adjust using the control lever Confirm  Confirm  Confirm  Adjust using the control lever Confirm  Confirm  Adjust using the control lever Confirm  Confirm  Confirm  Adjust using screw				Delow 945	5.3 -0.5	_	
2. Control Lever  H  A00 above 500  Description  Full-load Adjustment  O Above 500  Description  Full-load Adjustment  O Adjust using the control lever Confirm  Confirm  O Confirm  O Confirm  O Confirm  O Control Lever Angle  Measure the control lever angle at the "idling" and "full" positions.  When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.  When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  O 16 + 0.2  Adjust using the control lever  Confirm  Adjust using screw	1. laring sub s	bring					,
# 400 5.4 Confirm  Full-load Adjustment 900 14.5 - Confirm  Control Lever Angle Measure the control lever angle at the "idling" and "full" positions.  When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.  When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.  Control Rack Limiter 0 16 + 0.2 - Adjust using screw	2 Control Leve	r	<del></del>	1 0	ahove 6 9	_	
above 500 0.5  Full-load Adjustment 900 14.5 - Confirm  Control Lever Angle Measure the control lever angle at the "idling" and "full" positions.  Measurement When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.  When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.  Control Rack Limiter 0 16 + 0.2 - Adjust using screw	a. concret zeve	-	н	1	1		
Full-load Adjustment  900  14.5  - Confirm  Ontrol Lever Angle  Measure the control lever angle at the "idling" and "full" positions.  When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.  When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  0  16 + 0.2  - Adjust using screw				1			Conziziii
Control Lever Angle  Measure the control lever angle at the "idling" and "full" positions.  When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.  When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  O  16 + 0.2  Adjust using screw	,						
<ul> <li>When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> <li>Control Rack Limiter</li> </ul>	Full-load Adjus	tment	<u></u>	900	14.5	-	• Confirm
<ul> <li>When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> <li>Control Rack Limiter</li> </ul>	Control Loren A			Mongrey the	lantrol large are		
shifter's shim with a thicker one.  • When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.  Control Rack Limiter  0 16 + 0.2 - Adjust using screw	•		1	_			
• When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.  Control Rack Limiter 0 16 + 0.2 - Adjust using screw	Measurement						e full position, replace the
Shifter's shim with a thinner one.  Control Rack Limiter 0 16 + 0.2 - Adjust using screw							e "idling" position replace the
Control Rack Limiter 0 16 + 0.2 - Adjust using screw				<b>)</b>			e raring position, reprace the
Adjustment	Control Rack Lin	miter		<del></del>		-	Adjust using screw
i i	Adjustment						-



F7

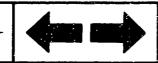
F6



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### Figure 109

- 1 = Screw
- 2 = Screw
- 3 = Screw
- 4 = Spring capsule
- 5 = Spring capsule
- 6 = Screw



F9

# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	: 9 400 610 231 1/4
ZEXEL No.	: 106692-4323
Date	: 31.10.1992 [5]
Company	: KOMATSU
Engine	: S6D125 / 6151-71-1220

 IP-Type number
 : 106069-5540 / PE 6P

 Governor type number
 : 105407-2822 / EP/RSV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar: 1.6

Test nozzle holder combination: 1 688 901 013

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $3.75 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)

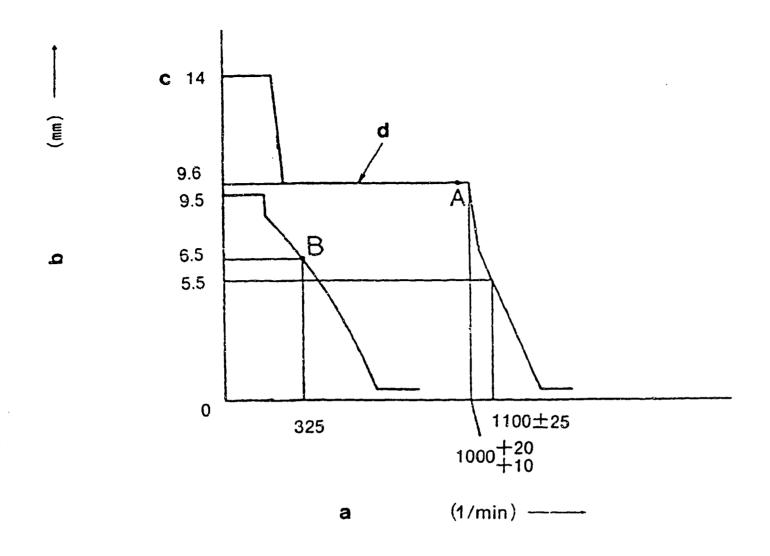


## Injection Quantity:

Adjusting Point	Rack Pos.	P. Speed	Injection Q'ty	Difference	Fixed	Remarks
	(mm)	(rpm)	(cm <sup>3</sup> /1000 str.)	(왕)		
A	9.6	1000	141.8 ± 2.0	± 3	Lever	Basic
Н	approx. 6.5	325	11.0 ± 1.5	± 15	Rack	
A	9.6	1000	141.8 ± 2.0	_	Lever	Basic
			Į.		,	

## Timing Advance Specification:

	Pump Speed (rpm)			
ſ	Advance	·		
	Angle (deg)			



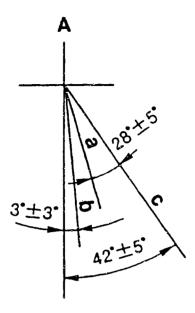


Figure 110

a = Pump speed

b = Control rack position

c = Above

d = Perform torque control spring
 adjustment when necessary

GOVERNOR ADJUSTMENT

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Recommended speed droop adjustment screw position: 16

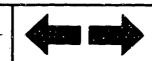
A = Speed Control Lever Angle

a = Idling
b = Stop

c = Full-speed

ZEXEL - Test values
Injection pumps

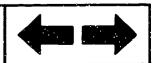
F13



F14  $\frac{ZE}{4\pi}$ 

ZEXEL - Test values

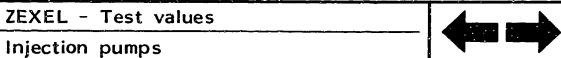
Injection pumps



- Note
- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 - 1.0 mm.

#### **ADJUSTMENT**

	Pump speed	Rack position	Remarks
	(rpm)	(mm)	
Full-load Adjustment	1200	9.6	Adjust using screw (2)
(Temporary)	700	9.6	Adjust using screw (1)
Torque Control spring Adjustment	-	-	<ul> <li>Adjust using spring capsule (4)</li> <li>Confirm</li> <li>Confirm the torque control stroke is: (mm)</li> </ul>
Idling Adjustment	0	9.5	• Fix the control lever
	325	6.5	<ul><li>Adjust using spring capsule (5)</li><li>Confirm</li></ul>
Maximum-speed Adjustment	1000+20	9.6	• Fix the control lever
	1100±25	5.5	<ul><li>Confirm speed droop - adjust using screw (3)</li><li>Confirm</li></ul>
Full-load Adjustment	1000	9.6	• Confirm
Control Lever Angle Measurement	shim with a thicker one.	pressed toward the "f	and "full" positions.  Full" position, replace the shifter's  Edling" position, replace the shifter's
Rack Limiter Adjustment	-	-	Adjust using screw





**ZEXEL** - Test values

Injection pumps

F15

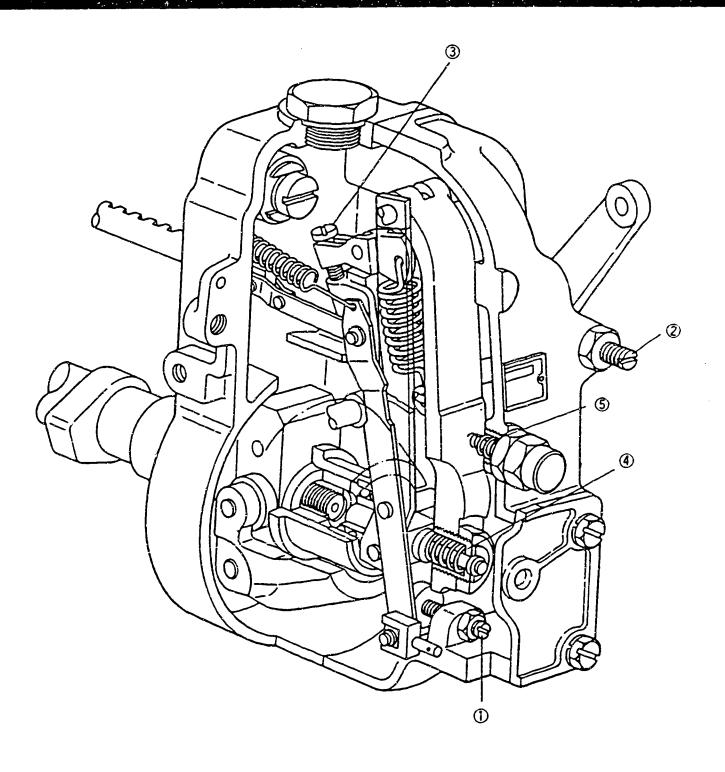


Figure 111

1 = Screw

2 = Screw

3 = Screw

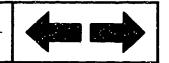
4 = Spring capsule

5 = Spring capsule

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ZEXEL - Test values

Injection pumps



F18

**ZEXEL** - Test values

Injection pumps



## ZEXEL - TEST VALUES Injection pumps

BOSCH No.	:	9 400 610 234	1/4
ZEXEL No.	:	106692-4403	
Date	:	31.10.1992	[0]
Company	:	KOMATSU	
Engine	:_	S6D125 / 6151-71	-1112

 IP-Type number
 : 106069-5420 / PE 6P

 Governor type number
 : 105407-2961 / EP/RSV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C : 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 1 688 901 013

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $3.75 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)



## Injection Quantity:

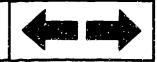
Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm³/1000 str.)	Difference (%)	Fixed	Remarks
A	9.1	1100	120.8 ± 2.0	± 3.0	Lever	Basic
Н	approx. 6.5	350	12.3 ± 1.5	± 15.0	Rack	
А	9.1	1100	120.8 ± 2.0	-	Lever	Basic
				<del></del>		

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### Timing Advance Specification :

Pump Speed (rpm)			
Advance			
Angle (deg)			

ZEXEL - Test values Injection pumps



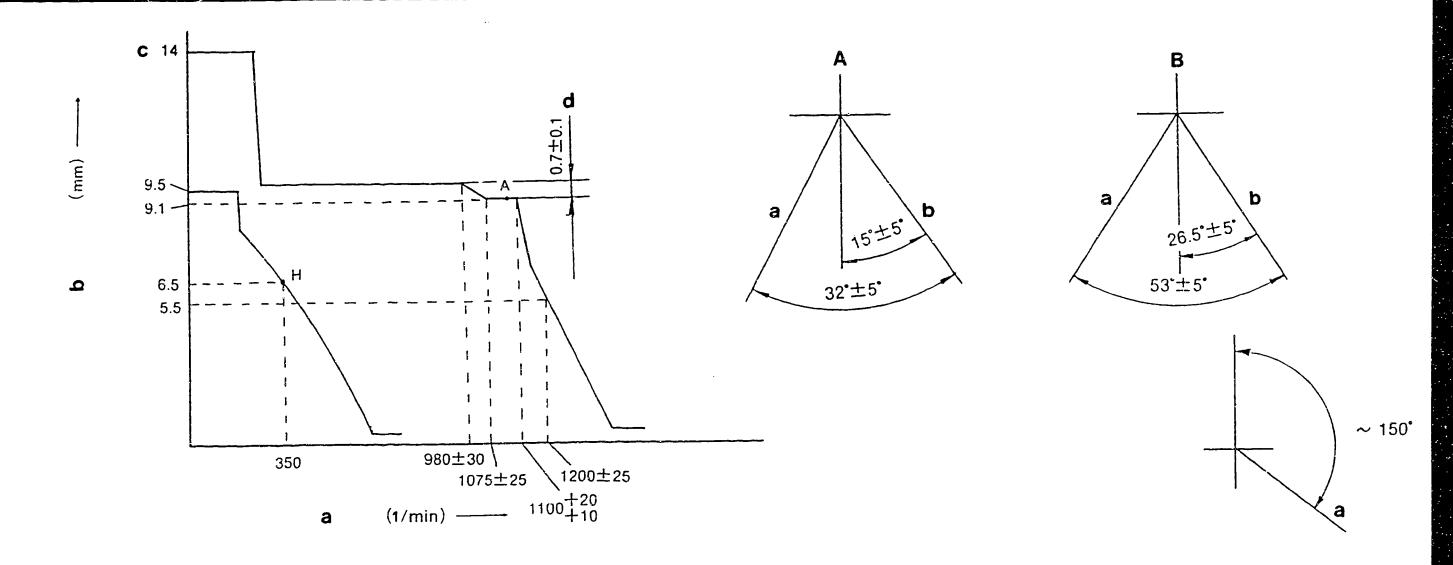


Figure 112

a = Pump speed

o = Control rack position

c = Above

d = Difference in control rack position
 between 1100 rpm and 700 rpm

GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 17

A = Speed Control Lever Angle

a = Idling

b = Full-speed

B = Stop Lever Angle

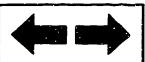
a = Stop

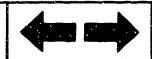
b = Normal

TIMING SETTING

At No. 1 plunger's beginning of injection position.

a = Coupling key groove position





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- Note
- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 - 1.0 mm.

## ADJUSTMENT

			Pump Speed	Rack Position	Boost pressure	Remarks
			(rpm)	(mm)	kPa (mmHg)	
Full-load Adjus	tment		1300	9.1	-	Adjust using screw (2)
(Temporary)			700	9.1	İ	Adjust using screw (1)
Torque Control	1.st str	oke	880	9.8	-	Adjust using spring capsule (4)
Spring Adjust-	Spring Adjust-		980 ± 30	9.8		• Confirm
ment	i		1075 ± 25	9.1		Confirm the torque control stroke
						is: 0.7 ± 0.1 mm
	2.st str	oke	-	-	-	Adjust using spring capsule (4)
Ì	Ì					• Confirm
						Confirm the torque control stroke
1						is: (mm)
Maximum Speed A	djustment		1100+20	9.1	-	Fix the control lever
			+10			• Confirm speed droop -
i			1200±25	5.5		adjust using screw (3)
						• Confirm
Boost Compensat	Boost Compensator System			-	-	Fix the control lever
						Adjust using screw (6)
ļ						Confirm the boost compensator
						stroke is: (mm)
Idling Adjustme	nt		0	9.5	<del>-</del>	Adjust using the control lever
1. Idling Sub S	pring	H	365	6.5		• Adjust using spring capsule (5)
						• Confirm
2. Control Leve	r		-	-	-	Adjust using the control lever
		<u> </u>				
Full-load Adjus	tment		1100	9.1	~	• Confirm
Control Lever A	ngle			<del>-</del>		g" and "full" positions.
Measurement						e "full" position, replace the
			t .	m with a thicker		
						e "idling" position, replace the
<del></del>		<del></del> -	sniiter's sni	m with a thinner	one.	
Control Rack Li	miter		_	-		Adjust using screw
Adjustment						



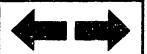


**F24** 



ZEXEL - Test values

F25 Injection pumps



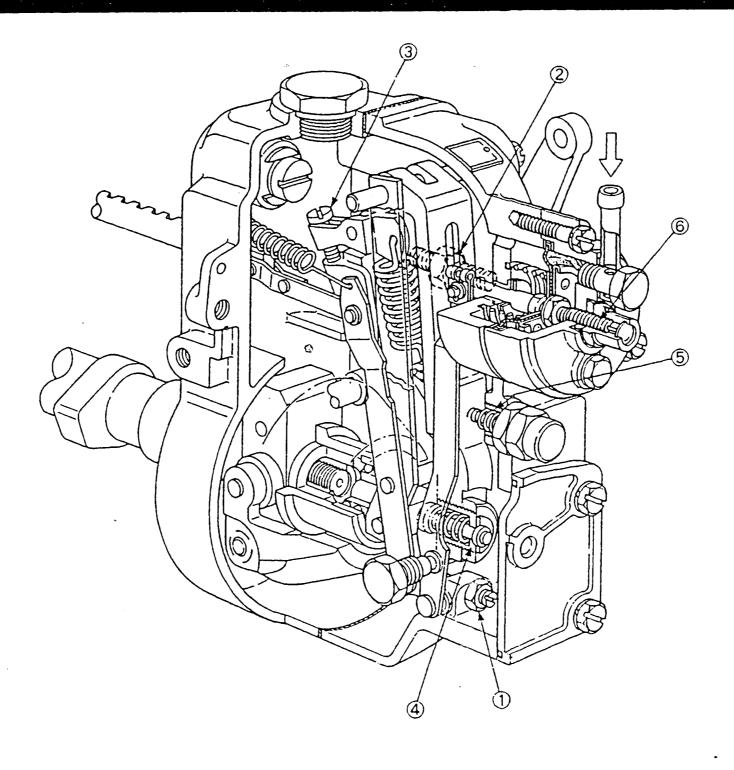


Figure 113

1 = Screw

2 = Screw

3 = Screw

4 = Spring capsule

5 = Spring capsule

6 = Screw

106692-4403 4/4



ZEXEL - Test values

Injection pumps

# ZEXEL - TEST VALUES Injection pumps

BOSCH No.	:	9 400 610 235	1/4		
CEXEL No.	:	106692-4593			
Date	:	31.10.1992	[0]		
Company	:	KOMATSU			
Engine	: S6D125 / 6151-71-1410				

 IP-Type number
 : 106069-5420 / PE 6P

 Governor type number
 : 105407-3363 / EP/RSV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 1 688 901 013

Opening pressure bar : 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $3.75 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)



## Injection Quantity:

Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm <sup>3</sup> /1000 str.)	Difference (%)	Fixed	Remarks
A	9.1	1100	120.8 ± 2.0	± 3.0	Lever	Basic
H	approx. 6.5	350	12.3 ± 1.5	± 15.0	Rack	
A	9.1	1100	120.8 ± 2.0	-	Lever	Basic

## Timing Advance Specification :

Pump Speed (rpm)			
Advance			
Angle (deg)			_

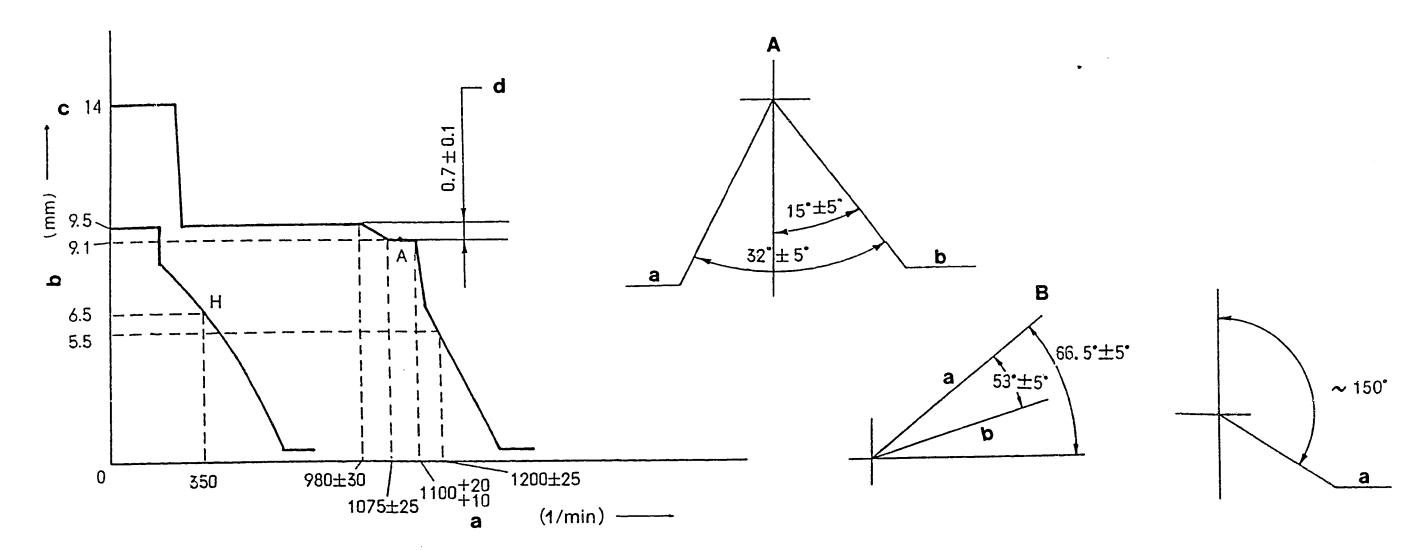


Figure 114

Pump speed

Control rack position

Above

d = Difference in control rack position between 1100 rpm and 700 rpm

GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 17

A = Speed Control Lever Angle

a = Idling

b = Full-speed

B = Stop Lever Angle

a = Normal b = Stop

TIMING SETTING

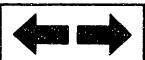
At No. 1 plunger's beginning of injection position.

a = Coupling key groove position

**ZEXEL** - Test values

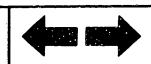
Injection pumps

**G4** 



**ZEXEL - Test values** G5

Injection pumps



106692-4593 2/4

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

#### **ADJUSTMENT**

	Pump speed	Rack position	Remarks					
	(rpm)	(mm)						
Full-load Adjustment	1300	9.1	Adjust using screw (2)					
(Temporary)	700	9.1	Adjust using screw (1)					
Torque Control spring	approx. 880	9.8	Adjust using spring capsule (4)					
Adjustment	980 ± 30	9.8	• Confirm					
	1075 ± 25	9.1	• Confirm the torque control stroke is 0.7 ± 0.1 mm					
Idling Adjustment	0	9.5	• Fix the control lever					
	350	6.5	<ul><li>Adjust using spring capsule (5)</li><li>Confirm</li></ul>					
Maximum-speed Adjustment	1100+20	9.1	• Fix the control lever					
	1200 ± 25	5.5	<ul> <li>Confirm speed droop - adjust using screw (3)</li> <li>Confirm</li> </ul>					
Full-load Adjustment	1100	9.1	• Confirm					
Control Lever Angle Measurement	• When the control lever is deposite shim with a thicker one.	• When the control lever is depressed toward the "idling" position, replace the shifter's						
Rack Limiter Adjustment	-	-	Adjust using screw					

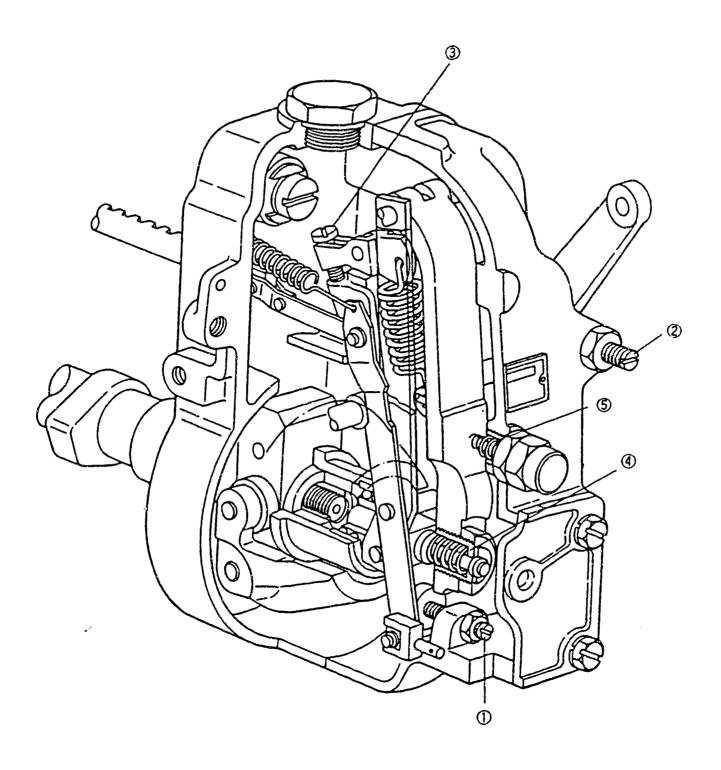


Figure 115

1 = Screw

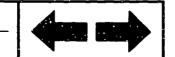
2 = Screw

3 = Screw

4 = Spring capsule

5 = Spring capsule

106692-4593 4/4



G9

## ZEXEL - TEST VALUES Injection pumps

BOSCH No.	:	9 400 610 236	1/4		
ZEXEL No.	:	106692-4633			
Date	:	31.10.1992	[2]		
Company	:	KOMATSU			
Engine	: S6D125 / 6151-71-1150				

 IP-Type number
 : 106069-5420 / PE 6P

 Governor type number
 : 105407-3711 / EP/RSV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar: 1.6

Test nozzle holder combination: 1 688 901 013

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $3.75 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)



## Injection Quantity:

Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm <sup>3</sup> /1000 str.)	Difference (%)	Fixed	Remarks
A	10.2	1100	152.7 ± 2.0	± 3.0	Lever	Basic
Н	approx. 6.5	350	12.0 ± 1.5	± 15.0	Rack	
А	10.2	1100	152.7 ± 2.0	-	Lever	Basic

## Timing Advance Specification:

Pump Speed (rpm)			
Advance			
Angle (deg)			

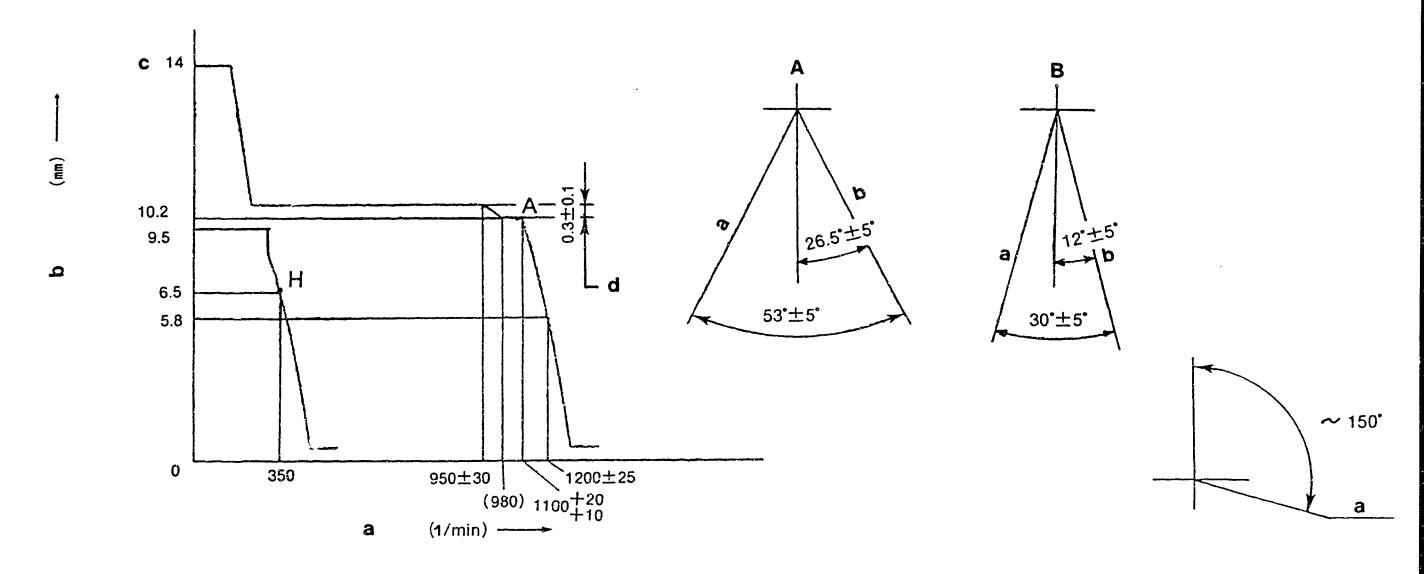


Figure 116

a = Pump speed

b = Control rack position

c = Above

d = Difference in control rack position
 between 1100 rpm and 700 rpm

GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 13

A = Stop Lever Angle

a = Stop
b = Normal

B = Speed Control Lever Angle

a = Idling

b = Full-speed

TIMING SETTING

At No. 1 plunger's beginning of injection position.

a = Coupling key groove position

G13



106692-4633 2/4

- Note
- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

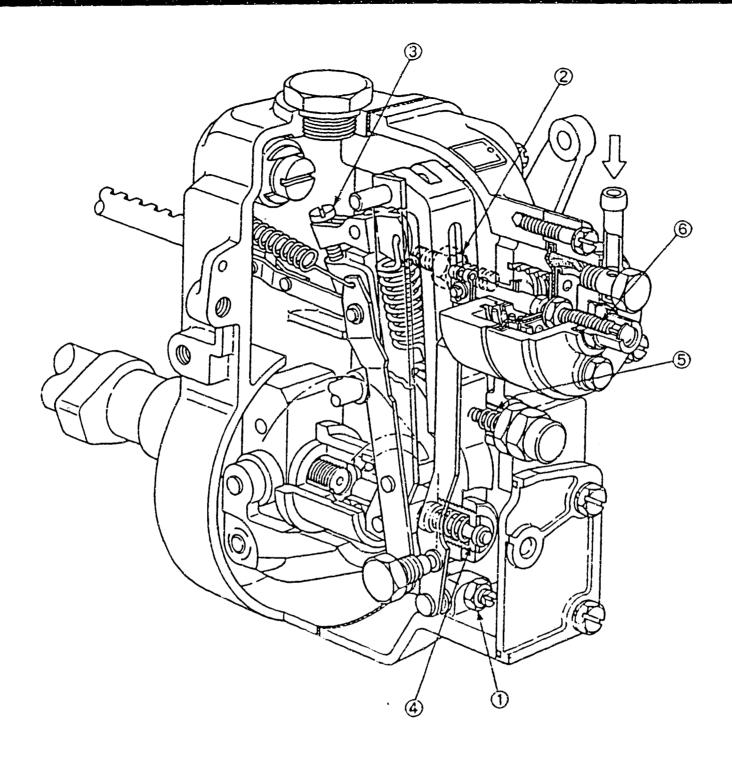
## ADJUSTMENT

	Pump speed	Rack position	Remarks				
	(rpm)	(mm)					
Full-load Adjustment	1300	10.2	Adjust using screw (2)				
(Temporary)	600	10.2	Adjust using screw (1)				
Torque Control spring	850	10.5	Adjust using spring capsule (4)				
Adjustment	950	10.5	• Confirm				
	980	10.2	• Confirm the torque control stroke is 0.3 ± 0.1 mm				
Idling Adjustment	0	9.5	• Fix the control lever				
	350	6.5	Adjust using spring capsule (5)				
	-	-	• Confirm				
Maximum-speed Adjustment	1100+20	10.2	• Fix the control lever				
	1200 ± 25	5.8	<ul><li>Confirm speed droop - adjust using screw (3)</li><li>Confirm</li></ul>				
Full-load Adjustment	1100	10.2	• Confirm				
Control Lever Angle Measurement	<ul> <li>Measure the control lever angle at the "idling" and "full" positions.</li> <li>When the control lever is depressed toward the "full" position, replace the shifter's shim with a thicker one.</li> <li>When the control lever is depressed toward the "idling" position, replace the shifter's shim with a thinner one.</li> </ul>						
Rack Limiter Adjustment	-	-	Adjust using screw				

G15



Injection pumps



106692-4633 4/4

Figure 117

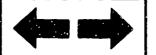
1 = Screw

2 = Screw

3 = Screw

4 = Spring capsule

5 = Spring capsule



# ZEXEL - TEST VALUES Injection pumps

: 9 400 610 237 1/4					
: 106692-4741					
: 31.10.1992 [0]					
: KOMATSU					
: S6D170 / 6162-73-1582					

IP-Type number : 106069-8060 / PES6PD Governor type number : 105448-9721 / EP/RSUV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 0 681 343 002

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $2.4 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)



#### Injection Quantity:

Adjusting Point	Rack Pos.	P. Speed	Injection Q'ty	Difference	Fixed	Remarks
	(mm)	(rpm)	$(cm^3/1000 str.)$	(용)		1
A	11.6	1000	289.0 ± 5.0	-	Rack	Basic Each cylinder
Н	approx. 6.7	350	39.3 ± 5.0	± 10	Rack	· · · · · · · · · · · · · · · · · · ·
A	11.6	1000	289.0 ± 5.0	_	Lever	Basic
В	approx. 15	100	358.5 ± 10.0		Lever	Control rack limit

## Timing Advance Specification:

Pump Speed (rpm)			
Advance			 
Angle (deg)			

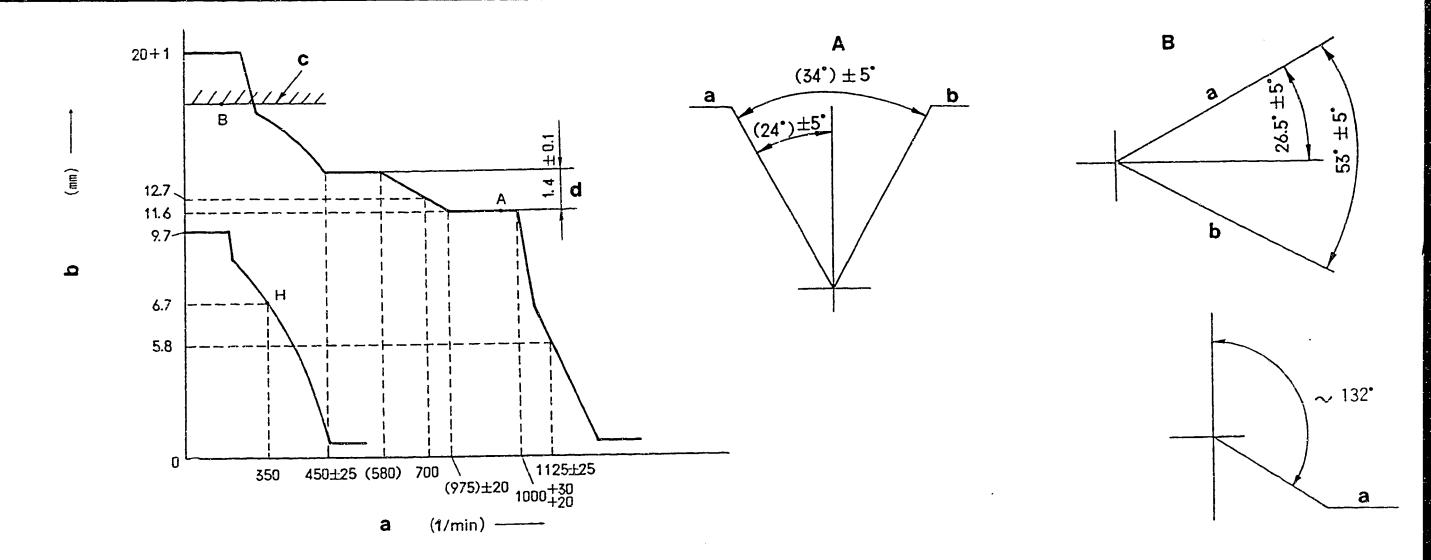


Figure 118

a = Pump speed

b = Control rack position
c = Control rack limit:

GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 20

A = Speed Control Lever Angle

a = Full-speed

b = Idling

B = STOP LEVER ANGLE

a = Normal

b = Stop

TIMING SETTING

At No. 1 plunger's beginning of injection.

a = Gear coupling's aligning mark
 position (on key groove)

106692-4741 2/4

- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

#### \* ADJUSTMENT

			Pump Speed	Rack Position	Boost pressure	Remarks		
			(rpm)	(mm)	kPa (mmHg)			
Full-load Adjustment			1200	11.6	-	Adjust using screw (2)		
(Temporary)			700	11.6		Adjust using screw (1)		
Torque Control   1.st stroke			450 ± 25	13.0	-	Adjust using spring capsule (4)		
Spring Adjust-						• Confirm		
ment						Confirm the torque control stroke		
						is: (mm)		
	2.st str	oke	approx. 480	13.0	<del>-</del>	Adjust using spring capsule (4)		
			700	12.7		• Confirm		
			approx. 975±20	11.6		Confirm the torque control stroke		
					İ	is: 1.4 ± 0.1 mm		
Maximum-speed Adjustment			1000+30	11.6	-	• Fix the control lever		
	<b>3</b>		+20					
			1125 ± 25	5.8		Confirm speed droop -		
						adjust using screw (3)		
						• Confirm		
Boost Compensate	or System	····	-	<u>-</u>	-	Fix the control lever		
-	-					Adjust using screw (6)		
						Confirm the boost compensator		
						stroke is: (mm)		
Idling Adjustment			0	9.7	-	Fix the control lever		
1. Idling Sub Spring H		350	6.7		Adjust using spring capsule (5)			
	_	ļ				• Confirm		
2. Control Lever -			-	-	-	Adjust using the control lever		
						• Confirm		
Full-load Adjustment			1000	11.6	-	• Confirm		
J					}			
Control Lever Angle			Measure the control lever angle at the "idling" and "full" positions.					
Measurement			When the control lever is depressed toward the "full" position, replace the					
			shifter's shim with a thicker one.					
			• When the cont:	<ul> <li>When the control lever is depressed toward the "idling" position, replace the</li> </ul>				
			shifter's shim with a thinner one.					
Control Rack Limiter			<del> </del>	222201	T	Adjust using screw		
Control Rack Li	miter		0	approx. 15	-	Adjust using screw		



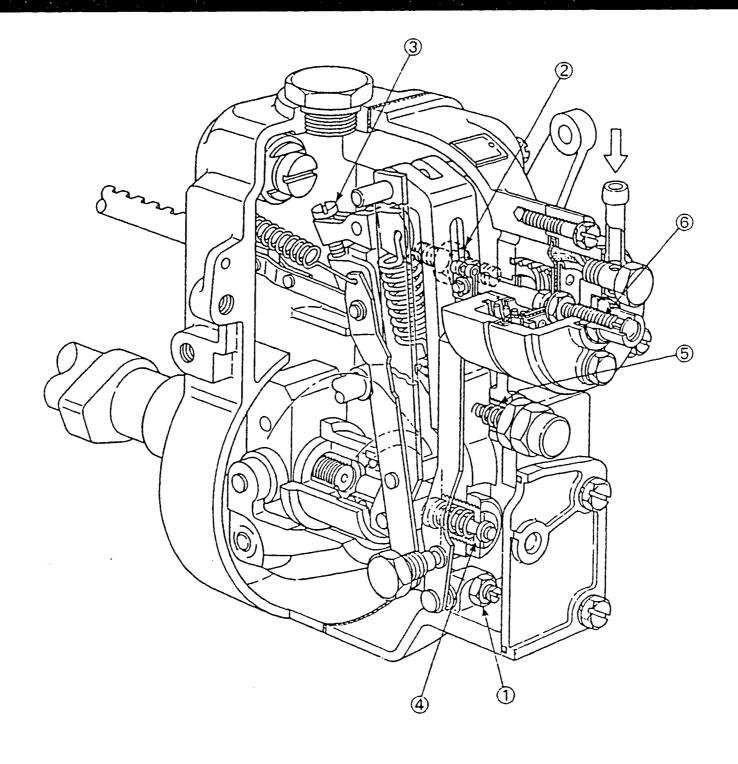


Figure 119

1 = Screw

2 = Screw

3 = Screw

4 = Spring capsule

5 = Spring capsule

6 = Screw

106692-4741 4/4



**G27** 

# ZEXEL - TEST VALUES Injection pumps

BOSCH No. : 9 400 610 238 1/4

ZEXEL No. : 106692-4752

Date : 31.10.1992 [0]

Company : KOMATSU

Engine : S6D125 / 6151-71-1450

IP-Type number : 106069-5420 / PE 6P Governor type number : 105407-3702 / EP/RSV

TEST PREREQUISITES

Test oil : ISO-4113

Test oil inlet temperature °C: 40.00...45.00

Inlet pressure bar : 1.6

Test nozzle holder combination: 1 688 901 013

Opening pressure bar: 175

Test pressure line

Inner x Outer Dia - Length mm : 3.00 x 8.00 x 600

PORT CLOSING

Prestroke mm :  $3.75 \pm 0.05$ 

Rod position mm : Port closing mark Cyl. No. : -

Cam sequence : 1-5-3-6-2-4

Port closing mark Cyl. No. : -

Port closing difference °NW: 0-60-120-180-240-300

Tolerance +- °C: 0.50 (0.75)



#### Injection Quantity:

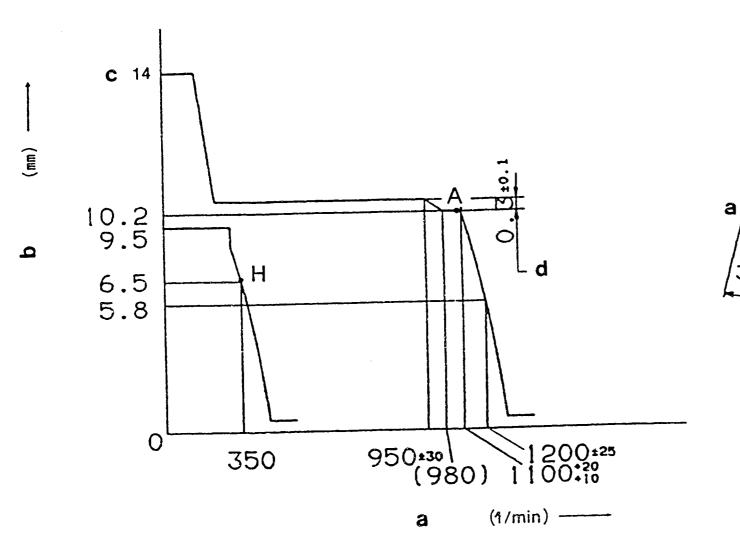
Adjusting Point	Rack Pos. (mm)	P. Speed (rpm)	Injection Q'ty (cm³/1000 str.)	Difference (%)	Fixed	Remarks
A	10.2	1100	152.7 ± 2.0	± 3	Lever	Basic
H	approx. 6.5	350	12.0 ± 1.5	± 15	Rack	
A	10.2	1100	152.7 ± 2.0	_	Lever	Basic

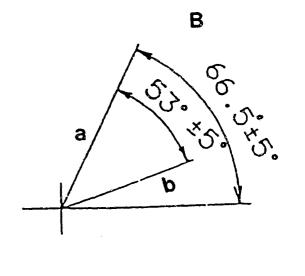
### Timing Advance Specification:

Pump Speed (rpm)			
Advance			
Angle (deg)			

ZEXEL - Test values

Injection pumps





~150°

106692-4752 2/4

Figure 120

a = Pump speed

b = Control rack position

c = Above

d = Difference in control rack position
 between 1100 rpm and 700 rpm

GOVERNOR ADJUSTMENT

Recommended speed droop adjustment screw position: 13

A = Speed Control Lever Angle

a = Idling

b = Full-speed

B = STOP LEVER ANGLE

a = Normal

b = Stop

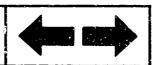
#### tion: 13

TIMING SETTING

At No. 1 plunger's beginning of injection.

a = Coupling key groove position

**H4** 



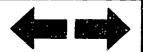


- Note
- Before adjustment, remove the idling sub spring.
- Move the control lever fully in the stop direction, and set the minimum-speed stopper bolt so that the control rack position is 0.5 1.0 mm.

#### ADJUSTMENT

			Pump Speed	Rack Position	Boost pressure	Remarks			
		(rpm)	(mm)	kPa (mmHg)					
Full-load Adjustment			1300	10.2	-	Adjust using screw (2)			
(Temporary)			700	10.2		Adjust using screw (1)			
Torque Control   1.st stroke			approx. 850	10.5	-	Adjust using spring capsule (4)			
Spring Adjust-			950 ± 30	10.5		• Confirm			
ment		approx. 980	10.2		Confirm the torque control stroke				
						is: 0.3 ± 0.1 mm			
j	2.st str	oke	-	_	-	Adjust using spring capsule (4)			
					}	• Confirm			
						Confirm the torque control stroke			
						is: (mm)			
Maximum-speed Adjustment			1100+20	10.2	-	Fix the control lever			
			+10						
			1200 ± 25	5.8	İ	Confirm speed droop -			
						adjust using screw (3)			
						• Confirm			
				<del></del>					
Boost Compensat	or system		_	-	-	• Fix the control lever			
						• Adjust using screw (6)			
						• Confirm the boost compensator stroke is: (mm)			
Idling Adjustme		<del></del>	0	9.5		• Fix the control lever			
1. Idling Sub S		н	350	6.5	-	Adjust using spring capsule (5)			
1. Idiling out of	bring	**	330	0.5		• Confirm			
2. Control Leve		<del>  _</del>		<u>.</u>	_	Adjust using the control lever			
2. 00::0202 20.0	_					Adjuse using the control level			
Full-load Adjustment			1100	10.2	<u> </u>	• Confirm			
,				_,					
Control Lever A	ngle		• Measure the c	ontrol lever angl	e at the "idlin	g" and "full" positions.			
Measurement		When the control lever is depressed toward the "full" position, replace the							
			shifter's shim with a thicker one.						
			When the control lever is depressed toward the "idling" position, replace the						
			shifter's shim with a thinner one.						
Control Rack Lin	miter	·····	-	-	••	Adjust using screw			
Adjustment						_			

**H6** 



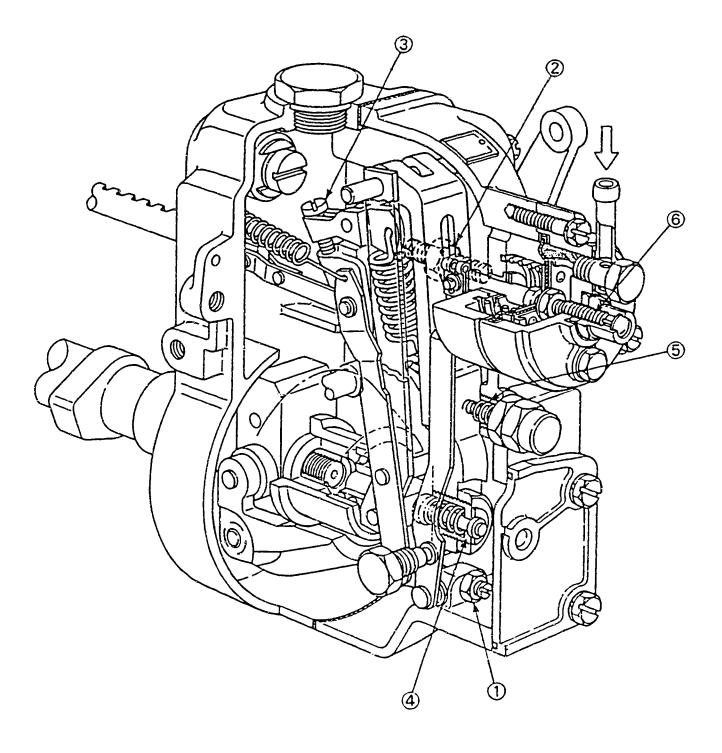


Figure 121 106692-4752 4/4

1 = Screw

2 = Screw

3 = Screw

4 = Spring capsule

5 = Spring capsule

6 = Screw

**4-11** 

ZEXEL - Test values

Injection pumps

**H9** 



**H8**